CSL

Signal Analyser

QUICK GUIDE & INSTRUCTION MANUAL

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INDEX

Part No AH 236600-003   23/3/2007

GPRS Radio Test Set Operation Manual

Description

The CS2366 is a radio test set for use with GPRS and GSM Radio Networks and the CSL CS2000 and CS2300 range of DualComs.

It may be used to aid positioning and the testing of GPRS and GSM aerial systems.

The Test Set will measure and display radio signal strength received, plus the level of interference may be measured and sources of interference identified.

The Test Set contains a battery allowing remote operation for up to 12 hours. The internal battery may be recharged from the supplied mains power supply.

If the Test Set is left switched on and unused, the unit will automatically switch off after a preset time.

The Test Set is contained within a strong protective sleeve and is supplied complete with a charger, aerial and manual.

The Test Set is covered by a no-quibble 'unit exchange' 2 year guarantee covering faulty materials and workmanship.

This operation guide is for Radio Test Set software version v1.05

Warning. Only use with the supplied charger.

Test Set Contents

Mains Plug-top Charger

Charging socket

Display

On/Off Pushbutton

Aerial fitted to Aerial connector

Protective Sleeve

Up, Down, Left, Right buttons

SIM Card (under protective sleeve)

CS2366   GPRS Radio Test Set

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Site Survey

Before specifying DualCom GPRS for any site it is recommended that you call the CSL Help Desk (see page 20) and ask for a GPRS signal strength prediction.

Alternatively, a Vodafone radio coverage map is via on the CSL web site.
Select: http://www.csldual.com/coverage
Map Type =Handset, and Handset Coverage = Standard Services.

For these predictions, you will need to have the Post Code of the site available. This will tell you if there is GPRS radio coverage at the proposed site.

If there is no GPRS radio coverage at the proposed site, the DualCom GPRS will **not** operate.

It is recommended that a Site Survey is conducted prior to installation of any DualCom GPRS or associated aerial system to confirm that an adequate radio signal is available at the site.

It is strongly recommended that a Site Survey is conducted when:

> **a)   The prediction suggests that the available signal strength is weak 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 CS2366 GPRS Radio Test Set is ideal for surveying a proposed site for a suitable radio signal. Note of the point of best signal. Install the DualCom's aerial at this location.

'Point of best signal'. This means:

> Maximise the SIG (high signal strength received from a base station)
>
> Minimise the BER (none or low level of interfering signals)

Full details of optimising Signal Strength and BER are on pages 17 and 18.

Using the Radio Test Set - Select the Mode

The Radio Test Set can be set to 'Surveyor' Mode, or to 'Engineer' Mode.

Select the mode that suits your requirements.

The Radio Test Set is supplied by CSL selected to the 'Surveyor' Mode.

Surveyor mode
Used by Installers and Surveyors to locate the best position when installing DualCom aerials or identify sources of interference.

Engineer Mode
Used by Radio and Network Engineers who require detailed technical data on networks and indivudual GPRS and GSM Base Stations.
See page 20 for more information.

To change the Mode of operation, follow steps 1, 2 and 3 on page 6, then...

With the **MAIN** Menu on the display...

Press the **Down** button to highlight the **SETUP** option.

Press the **Right** button to select the **SETUP** screen.

Press the **Down** button to highlight the **MODE** option.

Press the **Right** button to swap between **SURVEYOR** and **ENGINEER**.

When the desired Mode is displayed...

Press the **Up** button to highlight the **EXIT/SAVE** option.

Press the **Right** button to save the selection and return to the **MAIN** Menu.

Using the Radio Test Set - Surveyor Mode

Use the Test Set to do a Site Survey. See page 4.

1. Charge the battery before use.
   Connect the aerial.
   See pages 17 and 19 for information.

2. Switch the Test Set on.
   Press the **On/Off** button until the CSL Logo is shown
   This is followed by the **Startup screen**. ————
   Enter a PIN Code if required
   See page 15 and 16 for information.

   The **Startup screen** will be shown during registration.   30 seconds
   (30 secs. max.)

3. The **MAIN** Menu. ————
   See page 8 for information.

   Press the **Right** button to select the **SURVEY** screen.

4. The **SURVEY** screen. ————
   See page 9 for information.
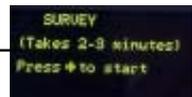
   Press the **Right** button to start the Survey.

   The Test Set will measure all detectable base stations.
   Keep the aerial upright.
   Do not move or touch the aerial.

                                                                       2 minutes

   Survey complete (2 mins. max).
   Shows number of base stations detected. ————
   (Poor signals will be indicated. The Test Set
   should be relocated and the test repeated)
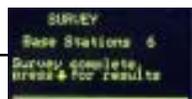
   Press the **Down** button to select the **RESULTS** screen.

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Using the Radio Test Set - Surveyor Mode

5. The **RESULTS** screen. ————————————————
    See page 10 and 11 for information.

    Press the **Left** & **Right** buttons to display each
    detected Base Station.
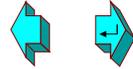
    Press the **Down** button to return to the **MAIN** Menu.

6. On the MAIN Menu...
    Press the **Down** button to highlight the
    STRONGEST SIGNAL option.

    Press the **Right** button to select the
    STRONGEST SIGNAL screen.
    See page 12 and 13 for information. ————————

    The display is updated every 6 seconds
    It will show the strongest base station.

    This display is used to locate an aerial in an area
    with the strongest signal strength.

    Use this location when installing the DualCom's aerial.
    See page 16 for more information.

7. Press the **Down** button to return to the **MAIN** Menu.

8. To switch off, press and hold the **On/Off** button
    for 2 seconds, then release.

    When no buttons are pressed for 9 minutes then
    the Test Set will automatically switch off.
   See page 14 for options.

Operation - MAIN Menu

This menu is where all functions are selected.
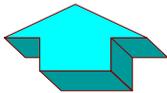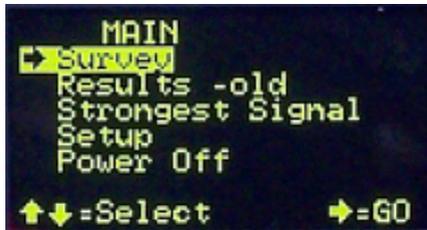
 Up (highlight an option)
Then select the required option (see below)
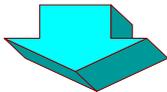
 Down (highlight an option)
Then select the required option (see below)
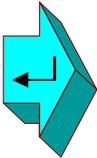
 **Select the highlighted option**
Survey = page 9
Results = page 10-11
Strongest Signal = page 12-13
Setup = page 14
Power Off = Switch off (same as Off button)
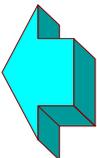
 no action

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.

Operation - SURVEY

Looks for all base stations in the area and measures their performance.
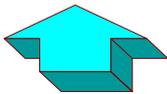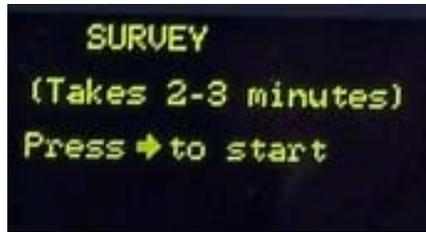
**Go to MAIN MENU**
See previous page
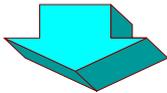
Go to MAIN MENU
See previous page

Start the Survey
This will take up to 2 minutes.
Keep the aerial upright
Do not move or touch the aerial
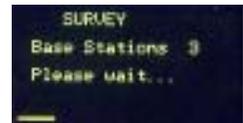
When complete...
 press the **Down** arrow to
see the results.
See next page.
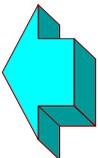
no action

Operation - RESULTS

Displays the performance of all base stations measured in the Survey.


```
        RESULTS

Base Stn:1
BAND 900        SIG:57%
                BER:Good

Network:UK VODAFONE
←→=View        ↓=EXIT
```
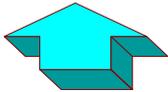
  no action
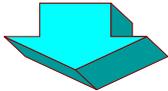
  Go to MAIN Menu
See page 8
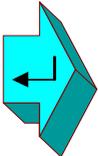
  Display first / next Base Station's results
See next page
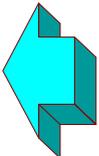
  Display previous Base Station's results
See next page

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.

Operation - RESULTS

Details about each detected Base Station will be displayed.

A high number of Base Stations with good Signal Strength (40% or more) and no interference = Good area for GPRS/GSM signals.

A low number of Base Stations with poor Signal Strength (30% or less) and/or high interference = Poor area for GPRS/GSM signals.

The **minimum** requirement for a DualCom installation is:
    2 Base Stations
    One Base Station has a Signal Strength of 40% or greater
    The second Base Station has a Signal Strength of 30% or greater
    BER on both Base Stations is Good.

BASE STN.:
    During the Survey, each detected base station is given a number.
    The base station with the strongest signal is given number 1.
    Higher numbers = lower strength signal.

BAND:
    The GPRS/GSM Band: 900 or 1800 MHz.
    The radio frequency band used by the displayed base station.
    Radio signals using 900MHz penetrate better into buildings.

SIG:
    Signal Strength.
    10% = Very low. 90% = Very high.
    Similar to DualCom's 7-segment display (0 to 9).
    Should be at least 40% for reliable DualCom usage.

BER:
    Interference (Bit Error Rate).
    Good = none or low levels of radio interference.
    Bad = medium or high levels of radio interference.


NETWORK:
    The network name of the displayed base station.

Operation - STRONGEST SIGNAL

Displays the base station with the strongest signal on the selected network.
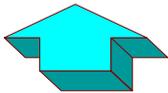
 no action
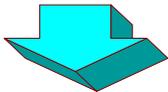
 Go to MAIN Menu
See page 8

 no action
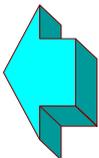
 no action

Operation - STRONGEST SIGNAL

The displayed base station is the strongest on the selected network.

The display is updated every 6 secs.

As the aerial is moved, then a different, stronger base station may be displayed.

Move the Test Set to locate a point with maximum Signal Strength (received from the base station).

The **minimum** requirement for a DualCom installation is:
    2 Base Stations
    One Base Station has a Signal Strength of 40% or greater
    The second Base Station has a Signal Strength of 30% or greater
    BER on both Base Stations is Good.

NETWORK:
    The network name of the displayed base station.

BAND:
    The GPRS/GSM Band: 900 or 1800 MHz.
    The radio frequency band used by the displayed base station.
    Radio signals using 900MHz penetrate better into buildings.

SIG:
    Signal Strength.
    10% = Very low. 90% = Very high.
    Similar to DualCom's 7-segment display (0 to 9).
    Should be at least 40% for reliable Dualcom usage.
    Best location for an aerial =highest Signal Strength

BAT:
    % = charge remaining in battery.
    100% = fully charged
    EXT = Charger connected.

Operation - SETUP

Settings to make the Test Set operate how you require.
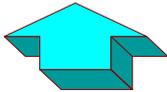
Up (highlight an option)
Then select the option. See below
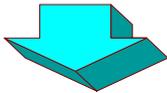
Down (highlight an option)
Then select the option. See below
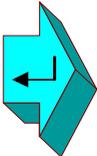
Do This for the selected Option
EXIT/SAVE = save settings then goto MAIN Menu
Contrast = Increase display brightness.
Screensaver = Increase minutes before Screensaver starts
Auto Off = Increase minutes to auto-power off
Mode = Change between 'Surveyor' and 'Engineer'
Load Defaults = Load default settings
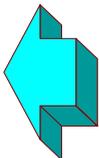
Do This for the selected Option
EXIT/SAVE = DO NOT save settings then goto MAIN Menu
Contrast = Decrease display brightness.
Screensaver = Decrease minutes before Screensaver starts
Auto Off = Decrease minutes to auto-power off
Mode = Change between 'Surveyor' and 'Engineer'
Load Defaults = no action

Operation - SCREENSAVER

Reduces battery usage to a minimum.

Moving Logo

Press any button to go to MAIN Menu
See page 8

Operation - Startup Screen

Shown during start-up & network registration. Shows version number.

Press any button to go to MAIN Menu
See page 8

Operation - PIN Code

Where the SIM Card has a PIN Code it will be required at power-up.
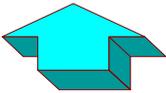
Delete digits
Press once to delete all digits.
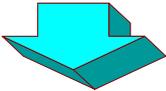
Use the displayed PIN number
First use the Left and Right buttons to enter the required PIN number, then...
press this once to select.

Select the next digit
Press once to select the next digit.
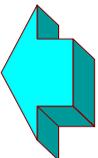
Change the number
Press repeatedly to increment the number until the correct number is shown.

Aerial Siting

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

The aerial should 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, wherever 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 installations 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: flourescent 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 etc.

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

Use the Test Set to find the point of best signal. This means:
    Maximise the SIG (high signal strength received from a base station)
    Minimise the BER (none or low level of interfering signals)

The **minimum** requirement for a DualCom installation is:
    2 Base Stations
    One Base Station has a Signal Strength of 40% or greater
    The second Base Station has a Signal Strength of 30% or greater
    BER on both Base Stations is Good.

The supplied short black aerial is for hand-held use, i.e. site surveys.
OR...
other GSM and GPRS aerials may be connected and tested. Use of a coaxial adapter may be required.

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

BER (Bit Error Rate)

The BER (Bit Error Rate) is the level of GPRS interfering signals received by the Test Set.

The BER measurement in the **Results** screen may be used to detect GPRS radio signals that are being corrupted by interfering radio signals.

Sources of interfering signals may be: flourescent or neon lighting, power distribution panels, power cable runs, fridges, freezers, air-conditioning and ventilation equipment as well as other electronic equipment, e.g. photocopiers, fax machines, computers, televisions etc.

This test may be used with a mobile aerial to detect locations where interfering signal strengths are stronger or weaker.

When determining a position for an aerial, for best performance, select a location where there are no effects from interference. See previous page.

In many cases, interfering sources only radiate short distances so that relocating the aerial 2 to 4 metres away from the source will cure interference effects.

When the BER measurement in the **Results** screen = **Good**

  The measured BER value indicates none or low levels of interference.

  This is the ideal BER reading that can only be achieved by locating the aerial away from sources of interference.

When the BER measurement in the **Results** screen = **Bad**

  The measured BER value indicates medium or high levels of interference.

  High levels of interference may may occasionally or completely inhibit operation. Relocation of the aerial to improve the BER is essential.

The **minimum** requirement for a DualCom installation is:
    2 Base Stations
    One Base Station has a Signal Strength of 40% or greater
    The second Base Station has a Signal Strength of 30% or greater
    BER on both Base Stations is Good.

Battery & Charging

Before first use, fully charge the battery.

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

A completely flat battery will recharge within 6 hours (typically 3 hours).

A fully charged battery will operate the Test Set for up to 12 hours.

The battery state may be read on the **Strongest Signal** screen.
See page 12-13.

When the charger is connected then the unit is always on and the On/Off button will not turn the unit off.

When the charger is disconnected then the Test Set will automatically switch off within one minute or after the preset time has expired.

If the Test Set is left switched on and unused (no buttons are being pressed), then to preserve the battery life, the unit will automatically switch off after a preset time. The preset time may be changed in the **Setup** screen. See page 14.

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

As with all rechargable batteries, over several years its capacity to store power will degrade. If the operational life of the battery reduces below 1 hour, contact the CSL Technical Support Desk for replacement information.

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

Help Desk

If you have checked all the above points but are still experiencing problems you can contact your DualCom Service Provider.

In UK, Vodafone GPRS network and DualCom questions may be addressed to:
  The CSL Technical Support Desk:
  Open Hours: 09.00 to 18.00 Weekdays
  Tel: 01895 474 444
  Email: support@csldual.com

Engineer Mode

'Engineer Mode' is similar in operation to 'Surveyor Mode' as described on pages 6-16, with the following additions:

1. In Engineer Mode, the **STRONGEST SIGNAL** screen is called the **MONITOR** screen.

2. When the **Survey** is running, the display shows **CELLS** and **OK**. All Base Stations detected are counted as **CELLS**. Only those Base Stations with good Signal Strength **and** good BER are counted as **OK**.

3. The **RESULTS** and **MONITOR** screen includes the Cellular identification number of the Base Station.

4. When the **RESULTS** and **MONITOR** screens are displayed, pressing the **UP** arrow will toggle between a 'normal' and a 'detailed' screen.

   This 'detailed' screen will include additional parameters. These are:

INDEX:	During the Survey, each detected base station is given a number. The base station with the strongest signal is given number 1. Higher numbers = lower strength signal.
NETWORK:	The network to which the base station belongs, e.g. Vodafone.
ARFCN:	Absolute Radio Frequency Channel Number
BSIC:	Base Station Identity Code. Identifies the beacon frequency.
CELL:	Cellular identification number of the base station.
LAC:	Local Area Code. Identifies the area in which the Cell is situated.
SIM:	The SIM Card. Not Fitted, Fitted or its status.
DBM:	FSSI Signal Strength. Scale = decibels ref to 1 mW.
CSQ:	FSSI Signal Strength. Scale = 0 - 31
BER:	Interference. Scale 1% = 1 bit corrupted per 100 bits received.
MCC:	Mobile Country Code. A three digit number = country (234 = UK)
MNC:	Mobile Network Code. A 2 or 3 digit number = network within the country. Vodafone = 15.
GSM:	900 or 1800 MHz. The radio frequency band used by the base station.
BAT:	BAT: % = charge remaining in battery. 100% = fully charged. EXT = Charger connected.

5. When the **MONITOR** screen is displayed and no SIM Card is fitted, any of the available radio networks may be selected.

Repeatedly press the **LEFT** arrow to highlight the required network, then...
Press the **RIGHT** button to select. Then wait (1 min max).

APPENDIX 1

Specification

Model	CS 2366 Radio Test Set
Dimension	(h x w x d) 135 x 78 x33 mm
Weight	210 grammes (includes aerial)
Temperature	-20C to +60C transit, -4C to +40C operating
Humidity	0 - 80% non-condensing
Warranty	2 years
Radio Path	GPRS and GSM
Battery	4 volt, 500mA/h Solid Electrolyte Lithium Ion
Charger	Nokia Type ACP-12X or alternative
Power consumption	Mains 50mA (operation & battery recharging)
Aerial connector	SMA

Paknet Radio Approval

The CS2366 Radio Test Set incorporates an independently tested & approved GSM/GPRS Radio Module that meets the requirements of European radio communication standards.

Approval Authority: **CE0168**

Warrenty

The unit is covered by a no-quibble 'unit exchange' 2 year guarantee covering faulty materials and workmanship.

There are no user-servicable parts inside. Opening the case will void warrenty.

Glossary of Terms

BER Bit Error Rate
A count or the level of interfering signals received by the Test Set.

CELL Cellular Identity Number
A number to uniquely identify each GSM/GPRS Base Station in UK.

CSL CSL DualCom Limited.
The company supplying DualCom products in UK.

FSSI Forward Signal Strength Indication
This is a value indicating the radio signal strength recieved from the base station at a DualCom or the Test Set.

GPRS General Packet Radio Service.
A packet based service, within the GSM radio network where cost is determined by Data Quantity (as distinct from a circuit switched network, where cost is determined by Time). Data rates range from 14.4 kbps, 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. Operates in 3 frequency bands 900MHz, 1800MHz & 1900MHz.

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.