



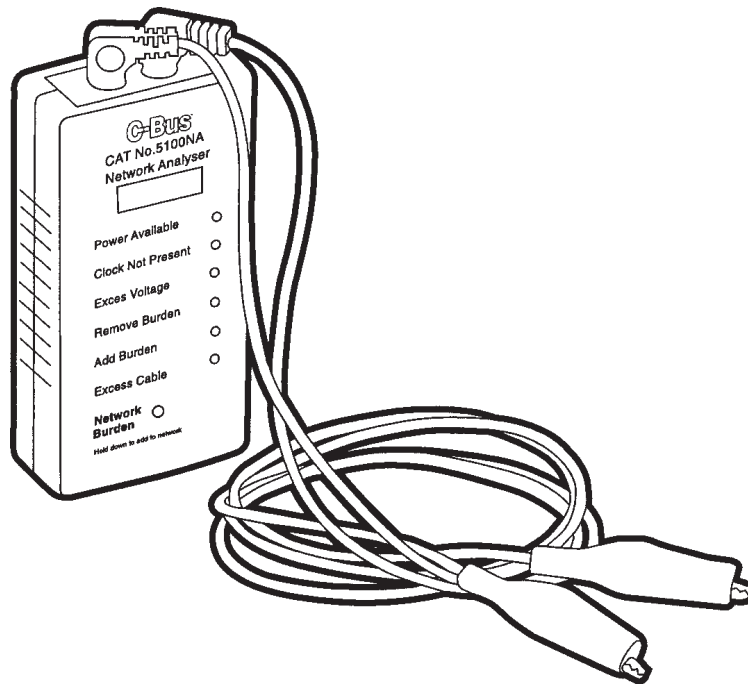
**CLIPSAL®**

# C-Bus™

## C-Bus Network Analyser

Operating Instructions

### 5100NA







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## 1. Product

Cat. 5100NA - C-Bus Network Analyser.

## 2. Contents of package

The following parts are included with the C-Bus Network Analyser. Cat. 5100NA

- A Network burden pack containing two network burdens and an instruction leaflet.
- A pair of Banana/Alligator-clip test leads.
- This installation instruction.

## 3. Description

The 5100NA Network Analyser is a C-Bus device designed to help installers quickly fault find a C-Bus network. The device analyses the network parameters and prompts the user for appropriate actions via its front LED (Light Emitting Diode) indicators.

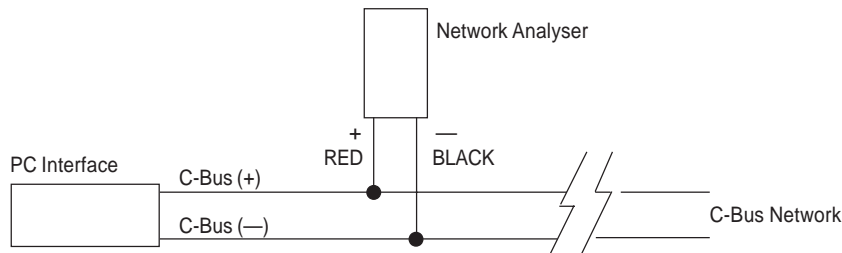
## 4. Capabilities

When connected to a C-Bus network, the 5100NA Network Analyser detects:

- Whether the network voltage is insufficient or excessive
- Whether the network clock is present
- Whether the network requires or has excessive network burden(s)
- Whether the network has excessive cabling

## 5. Connection to the C-Bus network

The Network Analyser connects to a C-Bus Network using a pair of standard banana plug leads that come with the device. The connection is polarity sensitive, and is colour coded on the terminals of the unit. When connecting to the C-Bus network, the user should ensure that the red terminal of the device is connected to the C-Bus (+) rail and the black terminal to the C-Bus (-) rail as shown in the diagram below.



**Connection of the 5100NA Network Analyser to the C-Bus network.**

**WARNING :** Remove the 5100NA Network Analyser from the network after fault finding. Permanent connection of the device to the network may severely slow down the communication and response time between C-Bus units. It is recommended that the 5100NA Network Analyser is connected to the C-Bus network at a location close to the PC Interface or Clipsal Home Minder PC Interface.

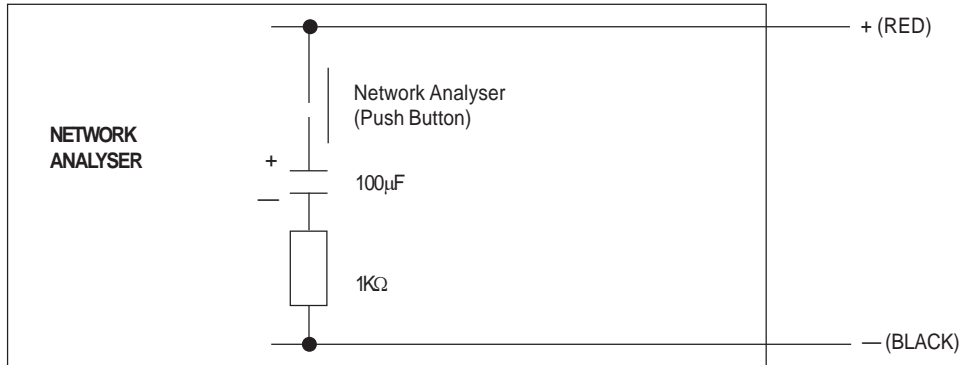
When there are multiple PC Interface units on the network, connection of the Network Analyser close to one of these units is sufficient.

## 6. Unit operation

The 5100NA Network Analyser draws approximately 20mA from the network it is connected to. The user should ensure that the C-Bus network to be tested has sufficient power supply margin to power the Network Analyser. When first connected there is a 5 second settling time during which the device establishes and stabilises itself. The Network Analyser then briefly turns on all LEDs to show that the indicators are in working order before analysing the network. When analysing a C-Bus network the Analyser shuts down the network communication briefly to determine network parameters and indicate to the user the network status via the LEDs which are described in the next section.

The Network Analyser repeats measurement of network parameters every 3 seconds while connected to the C-Bus network.

The Network Analyser also provides a test 1K $\Omega$  network burden. Connection of this 'Test network burden' to the C-Bus network being tested is made simply by pressing and holding down the '**Network Burden**' button. The test network burden is disconnected from the C-Bus network whenever the button is released.



### 7. Network Status indicators

Six LED indicators are provided on the front panel of the network analyser to show the network status, i.e. network clock, voltage status and whether network burden should be removed or added. The table below summarises the indicators and their functions.

<i>Indicator</i>	<i>Colour</i>	<i>Indicator Status</i>	<i>Action Required/Meaning</i>
<b>Power Available</b>	Green	ON	C-Bus power available
		FLASH	Network voltage low, $15 < V_{Net} < 20Vdc$
		OFF	Network has no power or $V_{Net} < 15Vdc$
<b>Clock not Present</b>	Red	ON	Network clock not Present
		OFF	Network clock status OK
<b>Excess Voltage</b>	Red	ON	Network voltage high, $V_{Net} > 38Vdc$
		OFF	Network voltage within range
<b>Remove Burden</b>	Red	ON	Excessive network burden, remove burden
<b>Add Burden</b>	Red	ON	Network requires burden, add burden to network
<b>Excess Cable</b>	Red	ON	Network has excessive cable
<b>Remove/Add/ Excess Burden</b>		Inconsistently turn ON and OFF	<ul style="list-style-type: none"> <li>• Network operates at limiting margins</li> <li>• Oscillation exists on network power supplies</li> </ul>

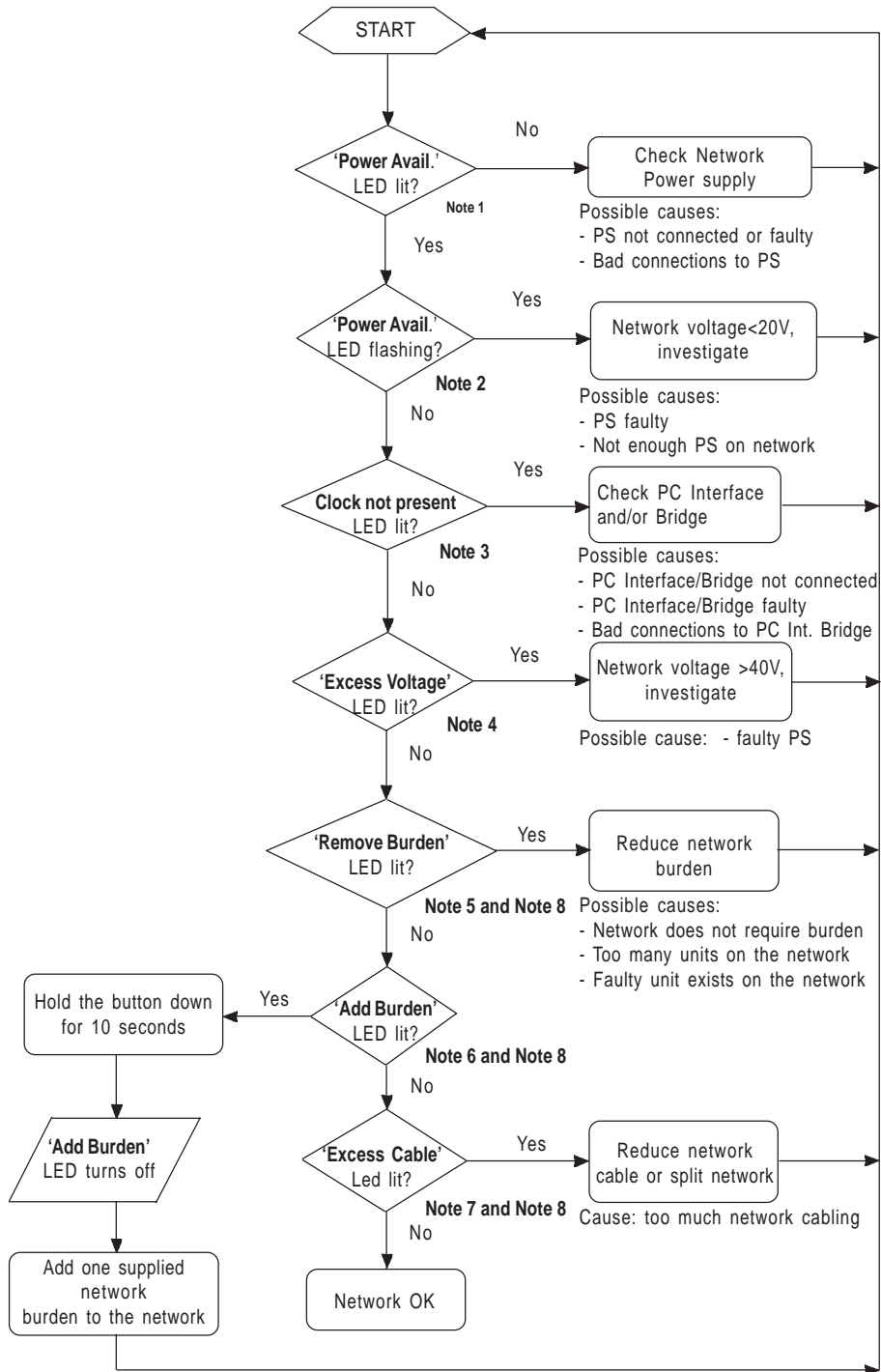
### 8. What to do when the Network Analyser indicates some network faults.

When a network fault is detected, the 5100NA Network Analyser indicates the fault to the user using its LED indicators. It is recommended that the faults are rectified one at a time followed by re-measurement of the network by the Network Analyser. This process is repeated until no faults are reported.

The Trouble Shooting Flow chart and Network Trouble Shooting Guide in the next section serve as a guideline for actions when using the Network Analyser to fault find the C-Bus network.



9. C-Bus Network Troubleshooting Flow Chart





## 10. Network Troubleshooting Guide (to be used with the Troubleshooting Flow Chart)

This guide is intended to provide C-Bus System Installers with assistance in solving network problems that may arise in field installations. Prior to using the Network Analyser for network diagnosis, it is advisable that the **C-Bus Calculator** Program is used to check operating conditions (resistance, power supply available) of the network in question.

Should a faulty C-Bus unit be identified, it must be returned to Clipsal Integrated Systems Pty Ltd for repair. Attempts to service the unit without prior consent of Clipsal Integrated Systems Pty Ltd will void all warranties applicable.

The following checks of C-Bus units require the use of a digital multi-meter (DMM).

### Note 1

When the Network Analyser is connected to the network and its 'Power Available' LED is not lit, it indicates either the network has no power supply or network voltage is below 15Vdc.

The installer should first check to ensure that the C-Bus Power Supply unit(s) is installed on the network. If so, check that its network connections are properly made, ie. no bad connections and whether mains has been connected and turned on.

When the above checks have been made, temporarily disconnect the Power Supply from the C-Bus network while it is powered from the mains supply. Connect a 1k $\Omega$ , 2W resistor across the unit's terminals and use the digital multi-meter to measure the DC voltage output. The voltage measured should be in the range 32-38Vdc, otherwise it is likely that the unit is faulty and should be returned to Clipsal Integrated Systems Pty Ltd for repair.

If several Power Supplies exist on the network, each of these units should be checked as described above.

It is possible that the power supply of the network is dragged down as a result of a short. Such a short circuit can be anywhere in the network and may be caused by loose connections (wires coming into contact with each other) or faults of other C-Bus units on the network. In such cases, a search to locate the short or faulty unit should be carried out. This can be done by splitting the network into smaller networks, each of which is checked using the analyser until the fault is located.

### Note 2

Whenever the Network Analyser's '**Power Available**' LED flashes, it indicates that an insufficient network supply condition exists, ie. network supply voltage falling between 15 to 20Vdc. This may be due to not enough power supply units on the network, a faulty power supply or a long cable run between the nearest power supply and the Network Analyser.

The installer should first check the PS units installed on the network as described in Note 1 above and replace any faulty PS units.

When all PS units on the network are verified, it is likely that there are insufficient PS units. Additional PS unit(s) should be installed to the network to correct the problem.

### Note 3

Communications between units within a C-Bus network require a network clock signal. This network clock can be generated by any of clock-generating units such as PC Interface, Bridge, Professional Series Dimmer, DIN Rail Relay and DIN Rail Dimmer.

The absence of network clock is indicated by the **Clock not Present** LED and can be due to any of the following:

- There is no clock-generating units installed on the network OR
- Connection to the installed clock-generating unit is poor OR
- The installed clock-generating unit is faulty.

First check to ensure that at least one clock-generating unit is installed on the network. If so, check that its network connections are properly made, ie. no bad connections at the unit's C-Bus terminals. Older versions of the PC Interface require mains connection in which case check also that mains has been connected and turned on. When the above checks have been made and the fault persists it is likely that the installed clock-generating unit is faulty and should be returned to Clipsal Integrated Systems Pty. Ltd. for repair.

### Note 4

The C-Bus network operates in the DC voltage range 15-38V. Communication pulses between C-Bus units are transmitted over the network on top of this DC voltage. Excess Network DC voltage causes communication signals to be clamped by internal protection diodes and thus distorted. This results in network communication becoming unreliable or even stopped.

Excess network voltage is caused by faulty power supply units(s) and indicated by the '**Excess Voltage**' LED of the Network Analyser. The installer should first check the PS units installed on the network as described in Note 1 above and replace any faulty PS units.



#### Note 5

Each C-Bus device possesses certain impedance that is seen by the C-Bus network when it is connected to the network. Some C-Bus units also allow the users to connect a built-in burden to the network either via an on board jumper (PC Interface) or via the User Installation Software, Version 2 (Professional Series Dimmer, DIN Rail Relay and DIN Rail Dimmer units).

A C-Bus network operates correctly when the total network burden is the range of  $400\Omega$  to  $1.5K\Omega$ . This total network burden is provided by the combination of impedances of all C-Bus units that are connected to the network. This includes also the external network burden and the built-in burdens that are enabled.

When the network burden value falls outside the specified range, communication over the C-Bus network becomes unreliable.

The **Remove Burden** LED of the Analyser turns on when a C-Bus network has too low an AC impedance. This occurs when :

##### 1. *Too many units exist on the network.*

Reduce total burden on the network by: Disabling all built-in network burdens (on the PC Interface, Professional Series and DIN Rail units)

- Disconnect the external Network burden if there is one connected.
- Splitting the network into smaller networks interconnected by a C-Bus Network Bridge unit may also be necessary.

##### 2. *More than one built-in burden enabled.*

All but one of the units that have built-in network burden should have their burdens disabled. Disabling built-in network burden on Professional Series and DIN Rail units require accessing of a computer which has the User Installation Software, Version 2 and appropriate Plug-in installed.

##### 3. *Faulty unit(s) exist on the network.*

Faulty C-Bus units can cause the network impedance to fall below the minimum allowable value ( $400\Omega$ ). A search should be carried out by repeatedly halving the network into smaller networks until the faulty unit(s) is located. When the Remove Burden LED of the Analyser is illuminated, the user should follow the above procedure in the same order to establish the exact cause of the fault.

#### Note 6

The **Add Burden** LED of the Analyser turns on whenever AC impedance of the network exceeds  $1.5K\Omega$ . This happens when a network of a small number of C-Bus units has no external network burden connected or none of the units that have built-in network burden have their burdens enabled.

A network burden should be added to the network by either :

- Enabling the network burden of only one unit that has a built-in network burden OR
- Connecting a supplied network burden to the network. Connection of this network burden to the C-Bus network is polarity sensitive, therefore the user should ensure that the burden is installed as per installation instruction leaflet included.

The user can test the effect of connecting a  $1K\Omega$  network burden to the network by holding down the **Network Burden** button for 10 seconds.

#### Note 7

Excessive network capacitance causes distortion of electrical signals transmitted over the C-Bus network and results in unreliable communication between C-Bus units. Excessive network capacitance is due to too much network cable and is indicated by the Analyser's '**Excess Cable**' LED.

When this occurs, network cable should be reduced by shortening the cable runs. If this is not possible, the C-Bus network should be split into smaller networks interconnected by C-Bus Network Bridge units.

#### Note 8

When a network operates at limiting margins:

- Network burden is just above the minimum value ( $400\Omega$ ) OR
- Network burden is just below the maximum value ( $1.5K\Omega$ ) OR
- Network capacitance is near the maximum specified ( $160nF$ ) value,

it is possible that the Network Analyser shows inconsistent results, ie. **Remove Burden**, **Add Burden**, **Excess Cable** LEDs turn on and off inconsistently.





In such cases, the user should rectify the indicated fault and re-measure network with the Analyser several times to ensure that the fault has been removed.

If, after this corrective action, this inconsistent LED indication still occurs, it is likely that oscillation exists on the network power supplies. Often such oscillation comes from any C-Bus unit that is capable of supplying power to the network. This includes :

- Power Supply unit, Cat. 5100PS or 5500PS
- Professional Series Dimmer, Cat. 5104D5/10/20
- DIN Rail Relay, Cat. 5512RVF and
- DIN Rail Dimmer, Cat. 5508D1A

A thorough investigation of this fault should be carried out with an oscilloscope to locate the source and to pre-empt network failure.

**11. Programming requirements**

Unlike other types of C-Bus devices, the 5100NA Network Analyser is a diagnostic tool, it does not require any programming and is not programmable.

**12. Important Warning**

Connection of the 5100NA Network Analyser to networks other than the C-Bus network may permanently damage the device and will void any warranties applicable.

**13. Product Specifications** - Safety extra low voltage according to AS3108/IEC 742:1983.

Input Voltage	10-43VDC
Input Current	20mA
Operating temp.	0- 45°C
Connections	2 x standard banana plug connection
Dimensions	120 x 60 x 28 mm (L x W x H)







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