X.21 Breakout Box HS

Black Box Corporation
The World's Source for Connectivity℠

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5. Abbreviated specifications and additional information

Number of breakout switches:..... 15

Number of RS232 probe points:..... 30

Number of three-state monitors:..... 6 in-line
1 GPD

Monitor impedance:..... > 2 KOhm

Dynamic response:

Assigned monitors DC-10Mb
Unassigned monitors/traps DC-10Mb/20nS

Power:..... Interface, lines 2/9,3/10,4/11, 5/12, 6/13 and 7/14
Two AA, 1.5v, alkaline batteries, stabilized mains adapter 3V / 25mA
One AAA 1.5 volt battery for X.21 source

Temperature:

Operating..... 0 to 50°C
Storage..... -25 to 70°C

there are any doubts you should connect the unassigned monitor (A and B) to the right and left socket, line B. The monitor/ trap will show if there are short duration changes.

Note: GPD disappears with moving equipment; this test must be done in “ready installations”.

3. After the GPD test, check both interfaces for active circuits and signals that should and shouldn’t be present (remember cables can have shorts or be broken). Use, if possible, the cables used in the ready installation.

This product is designed to look for problems known using X.21. Do not hesitate to contact Black Box if you encounter further interface problems.

How To Contact your Local Black Box

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To detect short duration changes in data or clock circuits, connect the monitor Pulse Trap inputs A and B to the pair of lines (A and B respectively) under test. Reset the Pulse Traps with the Reset button. When there is a positive or a negative pulse, the red or green Pulse Trap LED will illuminate.

4. Tricks and Traps

This chapter is aimed at people who have previous experience with using Breakout Boxes, and want to know how to both quickly and systematically test X.21 interfaces.

1. Connect the BOB with all switches open between the two interfaces to be tested. The BOB will immediately show if you are dealing with two interfaces of the same kind/or “matching” interfaces (signal missing on one side means cross patching, signals on both sides or all signals missing means a straight cable).

2. BEFORE GOING FURTHER, test for Ground Potential Difference! See chapter 3.3.

GPD failures are often very difficult to define. They may not be consistent and may only happen at certain times of day, when a device is switching ON or sometimes only in winter (heating switching).

This test is a must when the devices are connected to different wall outlets, even if they sit just 1 meter from each other the source (distribution panel) does not have to be the same.

The level of GPD changes with the way the mains is loaded, if

TSU0021.pub
pages 4 et 13

mardi 17 septembre 2002 mardi 17 septembre 2002

3.2 Control signal simulation

Tests on a X.21 interface often require signal simulation in various control, data and clock lines:
To simulate Space or Mark, in data or clock circuit, connect the pair of lines A, B, to the pair of Space or Mark Source sockets A, B, respectively.

3.3 Ground Potential Difference (G.P.D.) test

Ground Potential Difference develops when two pieces of equipment are powered from different power distribution systems or when a ground problem occurs in one of the devices. The following steps are required to test Ground Potential Difference:
- Connect the tester between both instruments via any cable supporting line # 1 (if applicable) and line # 8.
- Open (OFF) all 15-breakout switches.

One of the LED indicators located at position B lights up if G.P.D. is over 2V. Problems with signal level interpretation can occur if G.P.D. exceeds 2V and ground separation is required in one of the connected devices.

A more accurate test (0.3V) can be made using the unassigned monitor, to connect the 2 inputs (A and B) to the respective sockets of interface line B. The pulse trap will store short duration GPD changes.

3.4 Using the Pulse Traps

X.21 Breakout Box HS

CONTENTS

1. General Information

The X.21 Breakout Box HS is a universal tool for testing and troubleshooting interfaces between Data Terminal (DTE) and Data Communication (DCE) devices meeting CCITT recommendations.

This unit offers many features that are not available on other X.21 testers. These features include a clear and logical layout of the face-plate, full monitoring capability, separate Pulse Traps, Sources and Terminations for X.21 circuits, unique Ground Potential Difference test function and Power LED indicator.

3. Instructions for use

3.1 Monitoring and reconfiguration of the interface

Depending on the configuration and the particular problems to be solved, the X.21 Breakout Box HS has to be connected to one of the devices to be interfaced.

To monitor a standard DTE-DCE interface between the two X.21 devices:
- Switch the power OFF in both devices
- Disconnect one end of the interface cable
- Connect DTE and DCE to the tester's DTE and DCE connectors, respectively.

The tester monitors the status of the interface circuits according to the rules explained in section 2.2. The illumination of the red light means that the corresponding circuit is the SPACE/ON state. And the green LED signals the MARK/OFF space. Both LEDs light when the signal is a variable (data or clock), while both LEDs off mean lack of signal.

To monitor/reconfigure the non-standard interface (DTE-DTE, DCE-DCE), follow the same procedure neglecting the tester's DTE/DCE convention.

Enabling/disabling of the individual lines by means of the breakout switches and jumpering, crossing over or bussing the access sockets using jumper cables, allows for any modification of the interface.

TSU0021.pub
pages 6 et 11

mardi 17 septembre 2002 mardi 17 septembre 2002

External power: Two AA alkaline batteries (battery block with cord supplied) provide power for over 70 hours. Any stabilized mains adapter, 3v / 2.5mm monoplug / + on tip, can be used to power this unit. Plugging in an external source switches off the interface powering.

2. Functional Description

2.1 Interface connectors

The X.21 Breakout Box HS comes with 2 detachable dual gender cables, one with a female X.21 socket for the left (DTE) side of the box, and one with a male X.21 plug for the right side. This allows the tester to be connected without any extra cables in to a standard X.21 configuration.

2.2 Signal Status Display

The X.21 Breakout Box HS has 6 in-line monitors displaying all interface circuits. Each monitor circuit uses two LEDs indicating the state of the signal (MARK/SPACE/CLOCKING/NONE).

The states of data and clock signals are defined according the CCITT recommendation V10/11 (RS422/423) by the value of the voltage difference between lines “signal” (A) and “signal” (B) forming a balanced pair. The threshold level for the balanced circuit is 0.3 volt. The red LED indicates SPACE/ON state of the signal; the green LED indicates MARK/OFF state of the signal.

2.3 Signal Strength Test

The signal strength circuitry allows test of the signal voltage level at 0.3/0.6/1 and 2 volt.

2.4 Breakout switches

Each of the 15 assigned interface lines has an individual switch for breaking the circuit and network reconfiguration.

2.5 Access sockets

On both sides of the breakout switches there are sockets allowing direct access to both interfaces. This enables cross patching of lines by means of jumper cables. Access sockets also permit attaching Pulse Traps, and Source voltages to any line.

2.6 Jumper cables / Patching

Single and multiple chain jumper cables are provided for cross patching between various access sockets, Pulse Traps and Source voltages.

2.7 Ground Potential Difference test circuit

The difference in ground potentials between the 2 interfaced devices can cause problems with signal interpretation. The circuit testing this difference is connected between the left and right access sockets at line # 8 (Signal Ground). To test GPD open all 15 switches. Corresponding LED monitor located at position B shows excessive ground potential difference higher than 2V. A more accurate test (0.3v) can be made by connecting A and B

2.8 Pulse Trap Test Circuit

The X.21HS has one High Speed monitor/trap for latching and indicating fast pulses impossible to detect with the in-line monitors.

The balanced (A/B) Trap detects differential voltage changes of over the 0.3-volt threshold level.

Different voltages can be tested on any line by using the SS Traps, and Source voltages.

2.9 DC Source Voltage

The X.21 Breakout Box HS source is galvanically separated and provided by an AAA size 1.5-volt battery, the source voltage is protected by a serial 165-ohm resistance. One fresh AAA alkaline battery supplies power for over 200 hours sourcing (max. lifetime 5 years).

2.10 Power

The tester can be interface or externally powered. It takes current from 12 interface lines (each circuit is protected at 25mA). The unit consumes totally 15mA, which should cause no problem for normal mains powered equipment.

Small “in-cable” RS232/X.21 line powered interfaces will probably require external powering. The Power LED shows the