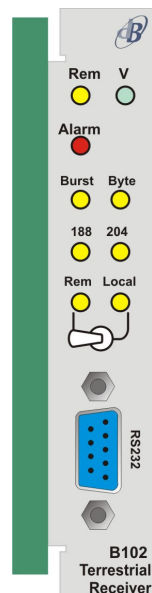


# B102

DVB-T COFDM receiver module



## Handbook

Version 0.8



# Certification and compliance

## CE certification

The B102 meets all the CE Class B requirements with the exception of Emission Requirements. To meet CE requirements, cables must be connected on all ASI outputs (ASI out 1 and ASI out 2). When cables are connected to these outputs then the device is compliant with FAIR-RITE 0443164151.

## FCC compliance

### FCC compliance notice

<b>Trade name</b>	dB Broadcast Ltd
<b>Product name</b>	DVB-T COFDM receiver module
<b>Product model number</b>	B102

These devices comply with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, this equipment may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician.

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.

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# Introduction

## The B102 terrestrial receiver

The Hawkeye B102 COFDM receiver module is a demodulator for use in professional applications where COFDM services are taken off-air and presented as DVB-ASI content to descramblers, decoders or stream processors, or for onward transmission in other networks.

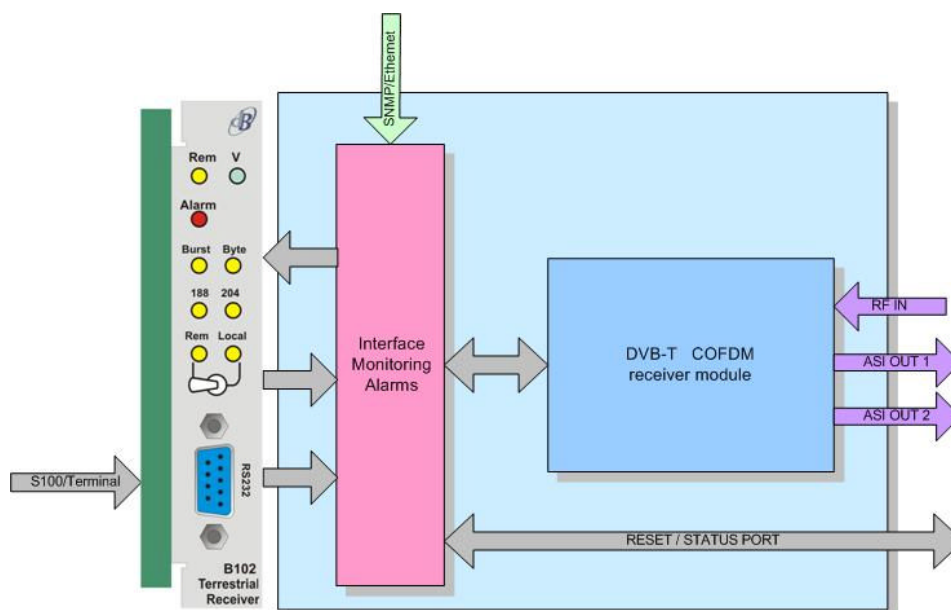
The B102 demodulates a DVB-T RF signal to a DVB-ASI Transport stream (TS) and covers the UHF Frequency bands IV and V (470-860MHz). In addition, tuning by frequency is possible from 150 – 860 MHz. The receiver is capable of receiving 8MHz and 7MHz bandwidth channels.

In 8MHz bandwidth mode the receiver is channel selectable for channels 21-69 with or without offsets at 1/6MHz (166KHz). In 7MHz Bandwidth mode it is channel selectable for channels 28-69 with or without offsets at 1/8MHz (125KHz). A separate MPEG decoder is required to decode the TS to video and audio.

Both channel frequency and symbol rate can be selected.

The module is housed within the V1606 (3RU) or F010 (1RU) chassis and uses the VB150 rear connector.

Status is indicated on the front panel, with additional advanced control, configuration and measurement functions available via S100 configuration software included with the module.



## Control options

Whilst the supplied S100 software provides full configuration and monitoring for individual modules via the RS232 front serial connector, remote control of multiple modules over a LAN is also available.

Control and monitoring of multiple modules over a network can be achieved via SNMP or by using the optional B067 Hawkeye Module Management software. In each case the frame requires both the B065 RS232/Ethernet controller and the V6081 rack controller.

It is recommended to use V1606 3RU frames when using rack controllers for LAN based module management systems.

**Note:** A built-in Command Line Interface protocol is also implemented to allow control and monitoring from an RS232 terminal or terminal emulator for individual modules.

## Features

- COFDM to DVB-ASI demodulation with dual DVB-ASI outputs
- Hot-swappable, compact module
- Tuning by frequency or preset channels with high and low channel offsets
- Demodulated outputs available in either burst or byte modes, 188 or 204 byte packets
- Supports both single- and multi-frequency networks
- Both high and low priority FEC and transport stream outputs supported
- 16, 64 QAM and QPSK constellations supported
- 7 or 8 MHz bandwidth supported
- Independent alarm thresholds for pre- and post-Viterbi
- CSI, UCE, BER measurements, alarm status feedback and configuration through S100 GUI software (included)
- Module status indicator available on front panel
- Low power consumption
- Optional rack based control and monitoring systems for multiple modules over a network
- Reset/Status port on rear connector

## Applications

- DVB-T single and multi-service demodulation
- Digital turn-around (DTA) systems
- Signal acquisition for translating or transcoding platforms
- Off-air monitoring, combined with descrambling or decoding modules
- Off-air signal measurement and monitoring with user-defined alarm thresholds

# General safety summary

## *Precautions to avoid personal injury, fire or product damage.*

Every care has been taken in the design, manufacture, assembly and testing of this product to obviate health and safety risks to personnel and to prevent fire or other hazards. However, please review the following safety precautions for continued protection.

**General use.** This product must only be used as specified in this manual. Failure to follow any ratings or directions for use may impair the protection provided.

**On receipt of the product.** Verify there is no damage and that all accessories are present .

**Suspected damage or failure.** Do not operate the product. Have it inspected by qualified service personnel or contact dB Broadcast or an authorised distributor.

**Operating environment.** The unit is for indoor use only. See the [Specification](#) chapter for further environmental, physical, certification and safety information.

**Do not operate in wet or damp conditions.**

**Do not operate in an explosive atmosphere.**

**Power cable.** Use only a power cable specified for this product and certified safe for the country of use.

**Grounding.** *This product must be grounded.* Before making any signal connections, ensure that the product is grounded. The product is grounded through the power cable. To avoid electric shock under fault conditions, the protective grounding conductor within the power cable must be connected to an earth terminal of the building in which the product is located.

**Mains supply voltage and fuse ratings.** See the [Specification](#) chapter. All ratings must be observed.

**Ventilation.** To prevent overheating do not obstruct ventilation holes.

**Cuts and abrasions.** When handling the equipment, guard against cuts or abrasions from metal parts of the case or components.

**CAUTION.** Caution statements identify conditions or practices that could result in damage to this product or other property.

**Toxic content.** Unwanted or obsolete components must be disposed of safely as some may release toxic vapours if incinerated.

**In case of difficulty.** Please refer to dB Broadcast.



### *Lithium battery*

A lithium battery is located in this product, which provides back up for the real-time clock. In normal operation this battery has a life in excess of 5 years. If the real-time clock's operation becomes erratic when cycling the power, then the battery may need replacing. Battery replacement should only be performed by a 'skilled and competent technician', or by returning to dB Broadcast for repair.

**CAUTION:** Danger of explosion if battery is incorrectly replaced.

### *Product damage precautions*

#### **Take anti-static precautions**

Since this unit contains exposed PCB and electronic components, ensure proper anti-static precautions are observed when handling this equipment.

#### **Provide proper ventilation**

To prevent product overheating, provide proper ventilation.

#### **Do not operate with suspected failures**

If you suspect there is damage to this product, have it inspected by qualified service personnel.

#### **There are no user serviceable parts**

Return to dB Broadcast or an authorized distributor for repair/service.

#### **Installation**

On receipt of the unit, open the box and verify that the unit and all accessory items included.

Save the shipping carton and packing materials in case it becomes necessary to ship the unit to dB Broadcast for service or repair.

# Installation

The B150 rear panel assembly must be installed prior to fitting the main decoder module. To do this, remove the blanking plate from the required slot in the rear of the rack.

Insert the rear panel assembly taking care to align the control and power pins at the top and bottom of the rear panel correctly. The RF connector goes towards the bottom of the rack.

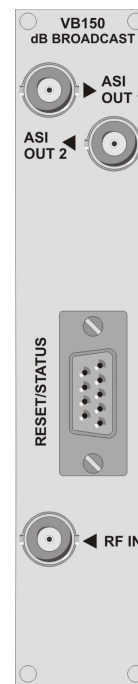
**CAUTION:** Damage to the module and/or chassis may occur if the rear panel assembly is not correctly installed.

Secure the rear panel assembly to the chassis using the 4 screws that held the blanking plate (M2.5 x 10mm).

Pull down the front panel and insert the module into the appropriate slot taking care to ensure it is within the top and bottom guides. Push the module fully home into the DIN connector in the rear panel assembly.

**CAUTION:** Always ensure the B102 module is only inserted into a slot with a rear panel of the correct type.

To remove the module from the rack pull the unit from the front of the rack using the handle.



## RF/ASI I/O

BNC	SIGNAL – B102	Details
RF IN	RF INPUT	Provides RF signal input with a sensitivity of $-28$ dBmV to $+14$ dBmV with nominal $75 \Omega$ impedance.
ASI OUT 1	ASI OUTPUT 1	DVB-ASI compliant transport stream output with nominal $75 \Omega$ impedance.
ASI OUT 2	ASI OUTPUT 2	As above

## Front panel RS232

RS232 – 9 way 'D' type	
PIN	SIGNAL
1	N/C
2	Transmit data (To PC)
3	Receive data (From PC)
4	N/C
5	Ground
6	N/C
7	N/C
8	N/C
9	N/C
<b>Shell</b>	Chassis ground

A one-to-one serial cable is suitable for use on the front panel serial port. USB-to-serial converter cables may also be used.

## Reset/Status port

The Reset / Status Port connector (labelled RESET / STATUS) is located on the rear-panel. The connector is a 9-pin sub miniature D-type with female contacts.

Reset/Status – 9 way 'D' type	
PIN	SIGNAL
1	Ground
2	Critical alarm common
3	Non-critical alarm NC
4	Non-critical alarm NO
5	Reset control
6	Critical alarm NO
7	Critical alarm NC
8	Non-critical alarm COMMON
9	Reset input
<b>Shell</b>	Chassis ground

The monitoring outputs are two sets of changeover relay contacts, one for critical alarm status and the other for non-critical alarm status.

**CAUTION:** Connecting or disconnecting cables whilst the module is powered on can result in damage to it's input circuits

### *Critical alarm*

The critical alarm indicates the total failure of the module. The only critical alarm condition is loss of power.

In the alarm condition, the relay is unenergised i.e. Critical Alarm Common (pin 2) is connected to Critical Alarm NC (pin 7). In the non-alarm condition, the relay is energised i.e. Critical Alarm Common (pin 2) is connected to Critical Alarm NO (pin 6).

### *Non-critical alarm*

The non-critical alarm indicates a recoverable fault condition. There are 4 possible non-critical alarms:

- Self-test failure
- Loss of Sync
- BER over threshold
- Power supply fault

In the alarm condition, the relay is unenergised i.e. Non-critical Alarm Common (pin 8) is connected to Non-critical Alarm NC (pin 4). In the non-alarm condition, the relay is energised i.e. Non-critical Alarm Common (pin 8) is connected to Non-critical Alarm NO (pin 3).

### *Reset*

Reset Control (pin 5) and Reset Input (pin 9) provide the facility to reset the module from an external source e.g. relay contact or switch.

To reset the module connect Reset Control to Reset Input for a period in excess of 10ms.

## Functional check

To ensure the terrestrial receiver is operating correctly complete the following procedures.

**Note:** Refer to the [Command Line Interface](#) chapter for details of the RS232 set up and serial command format for commands used in the following steps.

1. Power up the rack and ensure the green power indicator (+V) on the front panel is illuminated.
2. Connect an RS232 serial cable to the 9 way D-type connector on the front of the unit from a PC running a serial communications package. This will be required to set up the receiver. Move the Remote/Local switch on the front panel to the Local position.
3. Connect an appropriate terrestrial (COFDM) feed to the RF input and tune the receiver to a known channel frequency and bandwidth, and the correct DVB parameters Carrier Mode and Guard Interval.
4. To configure the receiver with these parameters you will need to use the serial commands '**CHANNEL**' or '**FREQ**', '**BANDWIDTH**', '**CARRIER**' and '**GUARD**'.

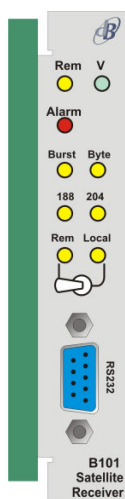
5. With these parameters configured the receiver should lock to the required channel. This is indicated by the packet length LED (either 188 or 204) being illuminated. Sync lock can also be verified using the serial command '**SYNC**'. If lock is not achieved check signal RF level, all connections and configuration and ensure the terrestrial feed is correct via a separate receiver.
6. The procedures above are a guide to ensuring the receiver is configured to lock to the terrestrial RF feed and provide an ASI Transport Stream (TS). To view the program content, connect the ASI TS output of the receiver to a DVB MPEG2 Decoder, connected to a picture and audio monitor. Some decoders will expect a particular setting for the ASI format and packet length. Check these parameters with the commands '**ASI**' and '**PACKET**'.

# Operation

The B102 can be controlled locally using the RS232 port and the supplied S100 software or using low-level commands from a terminal or remotely via Ethernet SNMP or B067 Hawkeye Module Management software.

## Front panel controls and LEDs

The front panel offers local monitoring & control features by means of its LEDs and switches.



### LED Indicators:

- Rem** Amber – Remote mode active
- V** Green – Indicates DC power present & OK
- Alarm** Red – Indicates fault condition detected
- 188, 204** Amber – ASI output mode; 188 or 204 byte
- Rem** Amber – Remote mode – SNMP via Ethernet
- Local** Amber – Local (RS232) mode

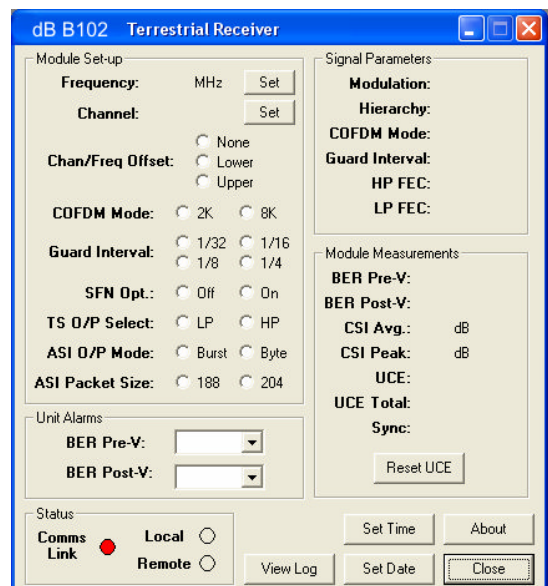
The two position front panel control switches between Remote (left position) and Local RS232 control (right position).

## Local RS232 control

S100 configuration software, which works with the B100-B130 series, is supplied with the B102 module.

It works via the RS232 port on the front of the module and does not require any other interface modules to be present in the rack.

The S100 software automatically selects which type of module it is connected to and displays the appropriate menu. It is possible to override the automatic selection and choose the correct menu manually.



Control is also possible by sending commands to the unit for monitoring and configuration using a standard RS232 terminal or similar application such as Windows® HyperTerminal.

Remote serial commands are persistent. They must be overridden by another command of equal or higher precedence, or switched off by the return to auto command. It is possible to drive this port remotely over a LAN using a LAN to serial converter unit (not supplied).

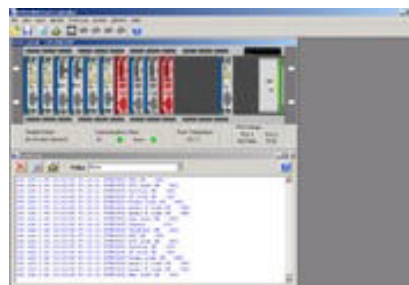
Command protocol and a list of local control commands are detailed in the [Command Line Interface](#) chapter.

## Remote control

When the front panel switch is in the 'Remote' position, control of multiple frames can be achieved over a network.

There are two ways this can be achieved; using SNMP or by using the optional B067 Hawkeye Module Management software.

The B067 software can control up to 10 V1606 3RU racks from a single PC. Each rack can be identified by either the IP address or a user-defined name, and accessed at the click of a button.



The active rack graphic, which mimics the actual appearance of the rack, shows module status (red indicates an alarm condition), communication link status, rack operating temperature and power supply voltage levels.

Alarms from all connected racks are aggregated and can be viewed in real time or stored to a nominated file for later analysis.

For either SNMP or B067 remote control, frames require both the B065 RS232/Ethernet controller and the V6081 rack controller.

**Note:** The B102 cannot be controlled over DARTnet.

# The Command-Line Interface

The Command-Line Interface (CLI) may be used for configuration, monitoring and control. It is provided to facilitate scripting and as an entry point for integration into existing software systems. It provides full access to all B102 features using a standard terminal emulation program such as HyperTerminal.

**Note:** If using HyperTerminal, we recommend using the PE version available from <http://www.hilgraeve.com/hpte/order.html>, due to a back scroll buffer bug which appears in the free version shipped with versions of MS Windows. This bug was corrected in Windows 2000 SP4 but appeared again in the version shipped with Windows XP.

The command line protocol is available via the front RS232 serial connection.

## Serial port connection

The front panel serial connector (labelled RS232) allows local control and monitoring using a PC. See the Installation chapter for connector information and pin-out.

Before initiating remote control set the PC serial port as follows:

<b>Speed:</b>	19200 baud
<b>Decoder protocol:</b>	1 start bit, 8 data bits, no parity, 1 stop bit
<b>Interface:</b>	RS232
<b>Handshaking:</b>	RTS/CTS

## Command syntax

The remote control commands use the standard ASCII character set and are split into two types: **Set** and **Get**.

### *Set command*

The Set commands are used to modify B settings.

The **Set** command format:

Set Command:            <Command> = <Setting> c/r  
Where:                    <Command> is the command string  
                             = is ASCII character 61  
                             <Setting> is the value to be set  
                             c/r is ASCII character 13



One of three responses are returned by the module to a Set command:

OK: Command implemented successfully  
COMMAND ERROR: Command was not recognized  
REMOTE CONTROL: Command was ignored because the unit is set to remote control mode

e.g. To set frequency to 474 MHz the command format is:

Command:           FREQ=474 c/r  
Result:            OK c/r

### *Get command*

Get commands return information about the module.

The **Get** command format:

Get Command:       <Command> ? c/r  
Where:             <Command> is the command string  
                    ? = ASCII character 61  
                    c/r is ASCII character 13

The reply format to the Get command is as follows:

Reply:             <Command> : <Value> c/r  
Where:             <Command> is the command string  
                    : is ASCII character 58  
                    <Value> is the setting  
                    c/r is ASCII character 13

e.g. To frequency setting the command format is:

Command:           FREQ? c/r  
Result:            FREQ: 474 c/r

## Remote command descriptions

The following remote control commands appear in alphabetical order:

### *ALM POS*

Sets or requests the BER Post-Viterbi alarm level.

#### **Request**

Command: ALM POS?  
Returns: Alarm level in e-notation

#### **Set**

Command: ALM POS=  
Parameter: 00 to 15 (See Table 1: BER alarm levels)  
Returns: OK if command valid COMMAND ERROR if command invalid

#### **Examples**

Command: ALM POS?  
Returns: ALM POS: 2.50e-04

Command: ALM POS=03  
Result: BER Packet Error alarm level set to 7.50e-05

Parameter	Alarm Level	Parameter	Alarm Level
00	0.00e+00	08	1.00e-03
01	2.50e-05	09	2.50e-03
02	5.00e-05	10	5.00e-03
03	7.50e-05	11	7.50e-03
04	1.00e-04	12	1.00e-02
05	2.50e-04	13	2.50e-02
06	5.00e-04	14	5.00e-02
07	7.50e-04	15	7.50e-02

*Table 1: BER alarm levels*

## *ALM PRE*

Sets or requests the BER Pre-Viterbi alarm level.

### **Request**

Command: ALM PRE?  
Returns: Alarm level in e-notation

### **Set**

Command: ALM PRE=  
Parameter: 00 to 15 (See Table 1: BER alarm levels)  
Returns: OK if command valid COMMAND ERROR if command invalid

### **Examples**

Command: ALM PRE?  
Returns: ALM PRE: 2.50e-04  
Command: ALM PRE=03  
Result: BER Packet Error alarm level set to 7.50e-05

## *ASI*

Sets or requests the ASI format.

### **Request**

Command: ASI?  
Returns: ASI: BYTE  
ASI: BURST

### **Set**

Command: ASI=  
Parameter: BYTE or BURST  
Returns: OK if command valid COMMAND ERROR if command invalid

### **Examples**

Command: ASI?  
Returns: ASI: BYTE Command:  
ASI=BURST  
Result: ASI format set to burst

## *BANDWIDTH*

Sets or requests the channel bandwidth.

### **Request**

Command: BANDWIDTH?  
Returns: BANDWIDTH: 8

### **Set**

Command: BANDWIDTH =  
Parameter: 7 or 8  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### **Examples**

Command: BANDWIDTH?  
Returns: BANDWIDTH: 8  
Command: BANDWIDTH = 7

## *BER*

Requests the current pre-Viterbi and post-Viterbi BER measurements

### **Request**

Command: BER?  
Returns: BER: <pre-v> <post-v>  
Pre-Viterbi and Post-Viterbi BER measurements in e-notation

### **Examples**

Command: BER?  
Returns: BER: 4.78e-03 4.17e-07

## *CARRIER*

Sets or requests the OFDM carrier mode.

### **Request**

Command: CARRIER?  
Returns: CARRIER: 2K  
CARRIER: 8K

### **Set**

Command: CARRIER=  
Parameter: 2K, 8K  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: CARRIER?  
Returns: CARRIER: 2K  
Command: CARRIER=8K  
Result: Unit OFDM carrier mode set to 8K.

### CHANNEL

Sets or requests the channel number.

#### Request

Command: CHANNEL?  
Returns: CHANNEL: 43U

#### Set

Command: CHANNEL=  
Parameter: Channel number 21 to 69 (8MHz BW),  
28 to 69 (7MHz BW),  
Channel offset 'L', ' ', 'U'  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: CHANNEL?  
Returns: CHANNEL: 50  
  
Command: CHANNEL=29L  
Result: Unit tuned to channel 29 lower offset

### CSI

Requests CSI average and peak measurements.

#### Request

Command: CSI?  
Returns: CSI: <average> <peak>

### Examples

Command: CSI?  
Returns: CSI: 023 000

## DATE

Sets or requests the unit date. The date format depends upon the date mode selected (Refer to DMOD command).

### Request

Command: DATE?  
Returns: DATE: dd/mm/yy (or mm/dd/yy)

### Set

Command: DATE=dd/mm/yy (or mm/dd/yy)  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: DATE?  
Returns: DATE: 06/02/02  
Command: DATE=09/11/01  
Result: Unit date set to 9th November 2001

## FREQ

Sets or requests the channel frequency. The format of the command string depends on whether the unit is set to 7MHz or 8MHz Bandwidth. In 7MHz mode the frequency can be set in steps on 0.5MHz.

### Request

Command: FREQ?  
Returns: FREQ: 606U

### Set

Command: FREQ=  
Parameter: Channel frequency 150 to 858 MHz  
Channel offset 'L', ' ', 'U'  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: FREQ?  
Returns: FREQ: 474U (for 8MHz Bandwidth Setting)  
FREQ: 474.5U (for 7MHz Bandwidth Setting)  
Command: FREQ=606U (for 8MHz Bandwidth Setting)  
FREQ=606.0U (for 7MHz Bandwidth Setting)  
Result: Frequency set to 606MHz upper offset

## GUARD

Sets or requests the guard interval.

### Request

Command: GUARD?  
Returns: GUARD: 1/4  
GUARD: 1/8  
GUARD: 1/16  
GUARD: 1/32

### Set

Command: GUARD=  
Parameter: 1/4, 1/8, 1/16, 1/32  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: GUARD?  
Returns: GUARD: 1/32

Command: GUARD=1/8  
Result: Guard interval set to 1/8

## HIER

Requests the hierarchical mode.

### Request

Command: HIER?  
Returns: HIER: Non-H  
HIER:  $\alpha = 1$   
HIER:  $\alpha = 2$   
HIER:  $\alpha = 4$

## HPFEC

Requests HP FEC rate.

### Request

Command: HPFEC?  
Returns: HPFEC: 1/2  
HPFEC: 2/3  
HPFEC: 3/4  
HPFEC: 5/6  
HPFEC: 7/8

### Examples

Command: HPFEC?  
Returns: HPFEC: 2/3

### LPFEC

Requests LP FEC rate.

**Note:** LP FEC is only valid for hierarchical modes.

Command: LPFEC?  
Returns: LPFEC: 1/2  
LPFEC: 2/3  
LPFEC: 3/4  
LPFEC: 5/6  
LPFEC: 7/8

### Examples

Command: LPFEC?  
Returns: LPFEC: 2/3

### LOG

Request command gets a single status log entry. Set command clears entire status log.

### Request

Command: LOG n?  
Parameter: n = 0 – 5 where 0 is latest log entry and 5 is oldest.  
Returns: LOG n: hh:mm:ss dd/mm/yy desc  
Desc Log entry description (see Table 2: Status log entry messages)

### Set

Command: LOG= (clears status log)  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: LOG 5?  
Returns: LOG 5: 18:14:06 05/02/02 +5V SUPPLY FAILURE

Command: LOG=  
Result: Entire status log cleared (all log entries deleted)



Status log entry message	Description
Log entry clear	No log entry
System reboot	Unit power cycled
Self-test failure	Unit failed power-on test
Sync lock lost	Sync lock has been lost
Sync lock regained	Sync lock has been regained
BER over threshold	BER alarm exceeded threshold
BER level ok	BER alarm returned below threshold
+5v supply failure	+5v supply has fallen below threshold
+5v supply ok	+5v supply returned above threshold
+3v3 supply failure	+3.3v supply has fallen below threshold
+3v3 supply ok	+3.3v supply returned above threshold
+2v5 supply failure	+2.5v supply has fallen below threshold
+2v5 supply ok	+2.5v supply returned above threshold
+30v supply failure	+30v supply has fallen below threshold
+30v supply ok	+30v supply returned above threshold

Table 2: Status log entry messages

## MER

Requests MER measurement in dB.

### Request

Command: MER?  
Returns: MER: <MER(dB)>

### Examples

Command: MER?  
Returns: MER: 24.5

## MOD

Requests the modulation mode.

### Request

Command: MOD?  
Returns: MOD: QPSK  
MOD: 16QAM  
MOD: 64QAM

## MODEL

Requests the unit model number.

### Request

Command: MODEL?  
Returns: MODEL: B102

## PACKET

Sets or requests the ASI packet length.

### Request

Command: PACKET?  
Returns: PACKET: 188  
PACKET: 204

### Set

Command: PACKET=  
Parameter: 188 or 204  
Returns: OK if command valid COMMAND ERROR if command invalid

### Examples

Command: PACKET?  
Returns: PACKET: 204

Command: PACKET=188  
Result: ASI packet length set to 188 bytes

## SERIAL

Requests the unit serial number.

### Request

Command: SERIAL?  
Returns: SERIAL: 1234567890

## SYNC

Requests the sync lock status.

### Request

Command: SYNC?  
Returns: SYNC: LOCKED  
SYNC: NOT LOCKED

## TIME

Sets or requests the unit time (24h clock format).

### Request

Command: TIME?  
Returns: TIME: hh:mm:ss

### Set

Command: TIME=hh:mm:ss  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: TIME?  
Returns: TIME: 13:03:49  
Command: TIME=17:10:15  
Result: Unit time set to 17:10:15

## TS

Sets or requests transport stream selection.

**Note:** LP transport stream is only available in hierarchical modes.

### Request

Command: TS?  
Returns: TS: LP  
TS: HP

### Set

Command: TS=  
Parameter: LP, HP  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: TS?  
Returns: TS: LP  
  
Command: TS=HP  
Result: HP transport stream selected.

## TSCTRL

Sets or requests the TS output control setting.

### Request

Command: TSCTRL?  
Returns: TSCTRL: NORMAL  
TSCTRL: NULL

### Set

Command: TSCTRL =  
Parameter: NORMAL, NULL  
Returns: OK if command valid  
COMMAND ERROR if command invalid

### Examples

Command: TSCTRL?  
Returns: PACKET: NORMAL

Command: TSCTRL =NULL  
Result: Set unit to output NULL transport stream.

## UCE

Requests current and cumulative uncorrected error counts.

### Request

Command: UCE?  
Returns: UCE: <current> <cumulative>

### Examples

Command: UCE?  
Returns: UCE: 00011 01079

## *VERMPU*

Requests the unit's main processor firmware number and version.

### **Request**

Command: VERMPU?  
Returns: VERMPU: FW0761 V01

## *VERPGA*

Requests the unit's FPGA firmware number and version.

### **Request**

Command: VERPGA?  
Returns: VERPGA: FW0762 V01

# System defaults

This section lists the system default values for user definable settings.

Item	Default setting
Channel	50
Frequency	706 MHz
OFDM carrier mode	2K
Guard interval	1/32
Output stream select	HP
ASI format	Byte
ASI packet length	204 bytes
BER Pre-Viterbi alarm level	1.00e-03
BER alarm level	2.50e-04

*Table 3: System defaults*

# Glossary

8-VSB	Eight discrete amplitude level, "vestigial side-band" broadcast transmission technology. VSB is an analogue modulation technique used to reduce the amount of spectrum needed to transmit information through cable TV, or over-the-air broadcasts used in the NTSC (analogue) standard. 8-VSB is the U.S. ATSC digital television transmission standard.
Ambient	The atmospheric conditions surrounding a given item. Normally in terms of factors which influence or modify, such as temperature, humidity, etc.
Amplitude	The magnitude of variation in a changing quantity from its zero value.
ASI	Asynchronous Serial Interface.
Attenuation	A reduction in power. It occurs naturally during wave travel, through lines, waveguides, space or a medium such as water. It may be produced intentionally by placing an attenuator in circuit. The amount of attenuation is generally expressed in decibels per unit of length.
ATSC	Advanced Television Systems Committee. Formed to establish technical standards for US advanced television systems. Also, the name given to the digital broadcast transmission standard.
Bandwidth	The range of frequencies over which signal amplitude remains constant (within some limit) as it is passed through a system.
BER	Bit Error Rate. Bit errors are caused by interference, or loss of signal, so the stream of bits composing the DTV picture is disrupted. A measure of the errors in a transmitted signal.
BNC	A radio frequency connector with an impedance of 75 ohms, designed to operate in the 0 to 4 GHz frequency range.
C/N	Carrier to Noise ratio. A measurement of the ratio of RF signal power to noise power.
COFDM	Coded Orthogonal Frequency Division Multiplexing. COFDM can transmit many streams of data simultaneously, each one occupying only a small portion of the total available bandwidth.

	The DTV standard used in Europe.
dB (Decibel)	A logarithmic unit used to describe signal ratios. For voltages $dB = 20 \text{ Log}_{10}(V1/V2)$ .
DID	Data identifier.
DTV	Digital television. This comprises all the components of digital television, including HDTV, SDTV, datacasting and multicasting.
DVB	Digital Video Broadcasting
DVB-C	Digital Video Broadcasting baseline system for digital cable television.
DVB-S	Digital Video Broadcasting baseline system for digital satellite television.
DVB-T	Digital Video Broadcasting baseline system for digital terrestrial television.
FEC	Forward Error Correction. A receiver technique for correcting errors in the received data.
GHz	Gigahertz. One billion cycles per second (10 <sup>9</sup> cps).
Headend	Electronic control centre of a cable system. The site for collecting signals from many sources, processing them and preparing them for distribution through the cable system's network of cables.
KHz	Kilohertz. One thousand cycles per second (10 <sup>3</sup> cps).
LSB	Least Significant Bit.
MER	Modulation Error Rate.
MHz	Megahertz. One million cycles per second (10 <sup>6</sup> cps).
Modulation	A process that moves information around in the frequency domain in order to facilitate transmission or frequency-domain multiplexing.
MPEG	Moving Picture Experts Group. Industry standard for compressing and decompressing digital audio video signals
MSB	Most Significant Bit.



MSps	Mega-symbols per second.
Multiplexer	An electronic device that allows multiple channels to be combined into a single signal.
OFDM	Orthogonal Frequency Division Multiplexing. Used in European digital television systems.
Packet	A variable-sized unit of information that can be sent across a packet-switched network.
PAL	Phase Alteration Line. 50 Hz video format used in much of the world outside of the USA.
PCR	Program clock reference.
PID	Packet identifier.
PSI / SI	Program specific information.
QAM	Quadrature Amplitude Modulation. A digital modulation technique that allows very efficient transmission of data over media with limited available bandwidth.
QPSK	Quadrature Phase Shift Keying. A digital technique that is widely employed in direct broadcast satellite or terrestrial transmission systems
RF (Radio Frequency)	In broadcasting applications, the signal after the modulation process.
RS	Reed-Solomon.
SNR	Signal to Noise Ratio.
Symbol Rate	Replacement term for Baud; a unit of signalling speed, the number of times a signal on a communications circuit changes.
Termination	An impedance at the end of transmission line that matches the impedance of the source and of the line itself. Proper termination prevents amplitude errors and reflections. ASI transmissions use 75 $\Omega$ transmission lines, so a 75 $\Omega$ terminator must be at the end of any signal path.
Tuner	Any device or apparatus used for selecting and controlling the operating frequency of a circuit or equipment, such as the channel selector in a television receiver.

UTP	Unshielded Twisted Pair.
Viterbi	Algorithm for Forward Error Correction.

# Specification

<b>Performance</b>	
<b>Tuning Range:</b>	150 – 858 MHz (Channel 21 – 69, 8MHz Bandwidth) (Channel 28 – 69, 7MHz Bandwidth)
<b>Input Level Minimum:</b>	-75dBm (64QAM) -81dBm (16QAM) -86dBm (QPSK) (2K & 8K, FEC 2/3, Guard Interval 1/4)
<b>Input Level Maximum:</b>	35dBm (all modulation modes)
<b>Input Return Loss:</b>	5.5dB min.
<b>Input Impedance:</b>	75Ω BNC
<b>FEC:</b>	Viterbi Puncture Rate; 1/2, 2/3, 3/4, 5/6, 7/8
<b>FFT:</b>	2K, 8K
<b>Guard Interval:</b>	1/32, 1/16, 1/8, 1/4
<b>Hierarchical Modes:</b>	Non-hierarchical, $\alpha = 1$ , $\alpha = 2$ , $\alpha = 4$
<b>DVB Output:</b>	2 x DVB-ASI, 75Ω BNC
<b>Power</b>	
<b>Input Voltage:</b>	15VDC – provided by rack PSU(s)
<b>Power Consumption:</b>	6 W Maximum
<b>Environmental</b>	
<b>Temperature (Operating):</b>	0 °C to +50 °C
<b>Storing Temperature:</b>	-20 °C to +70 °C
<b>Altitude (maximum operating):</b>	2000 meters (6500 feet )
<b>Relative Humidity (maximum operating):</b>	80% for temperatures up to 31 °C, decreasing linearly to 40% at 50 °C
<b>Physical</b>	
<b>Dimensions Height:</b>	100 mm (4 inches)
<b>Width:</b>	25 mm (1 inch)
<b>Depth:</b>	265 mm (10.5 inches) (not including rear panel)
<b>Net Weight:</b>	0.35 kg (0.75 pounds)

<b>Safety standards</b>	
<b>U.S. Nationally Recognised Testing Laboratory Listing:</b>	UL3111-1, standard for electrical measuring and test equipment
<b>Canadian Certification:</b>	CAN/CSA 22.2 No. 1010.1 Safety requirements for electrical equipment for measurement, control and laboratory use.
<b>European Union Compliance:</b>	Low Voltage Directive 73/23/EEC, amended by 93/68/EEC IEC 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use.

<b>Safety certification</b>	
<b>Equipment Type:</b>	Test and Measuring
<b>Safety Class:</b>	Class I (as defined in IEC 61010-1, Annex H) – grounded product
<b>Over voltage Category:</b>	Over voltage Category II (as defined in IEC 61010-1, Annex J)
<b>Pollution Degree:</b>	Pollution Degree 2 (as defined in IEC 61010-1) Note: Rated for indoor use only

<b>EC Declaration of Conformity – EMC:</b> Meets intent of Directive 89/336/EEC and 92/3EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:	
<b>EC Declaration of Conformity – Low Voltage:</b> Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC, amended by 93/68/EEC IEC 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use	
<b>EN50081-1 Emissions:<sup>1</sup></b>	
<b>BS EN55022:</b>	Class B radiated and conducted emissions
<b>BS EN55013:</b>	Emissions standard for Broadcast Equipment
<b>EN50082-1 Immunity:<sup>1</sup></b>	
<b>BS EN61000-4-2:</b>	ESD Requirements
<b>BS EN61000-4-3:</b>	Radiated susceptibility
<b>BS EN61000-4-4:</b>	Electrical Fast Transient Burst requirement
<b>BS EN61000-4-5:</b>	Surges requirement
<b>BS EN61000-4-6:</b>	Conducted susceptibility
<b>BS EN61000-4-11:</b>	Voltage Dips and Interruptions
<b>BS EN55103-2:</b>	Immunity for Product Family Standard, Audio, Video Audio Visual and Entertainment lighting control apparatus for professional use

**FCC Compliance:** Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits<sup>1</sup>

**FCC Information:** This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**WARNING:** The user must install the system as per manufacturers instructions, to comply with the requirements of FCC.

<sup>1</sup> Compliance demonstrated using high-quality, shielded cables.

# Ordering information

## *B102 module*

<b>B102</b>	DVB-T COFDM terrestrial receiver module
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## *3U Probel Vistek configuration*

<b>V1606-dB-2PSU</b>	3U Chassis, 14 module slots, 2 PSU slots (2 PSUs included)
<b>V1606-dB-48V</b>	3U Chassis, 14 module slots, 2 48V PSU slots (2 48V PSUs included)

## *1U Probel Vistek configuration (dual PSU)*

<b>F010</b>	1U Chassis, 2 module slots, 2 PSUs (PSUs included)
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## *Passive rear connectors*

<b>VB150</b>	BNC rear connector for B102 module
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## *Hawkeye Module Management*

Optional components for single point of control over Ethernet SNMP or RS232 recommended for use with Hawkeye modules in V1606 (3RU) frames.

<b>B065</b>	RS232/SNMP rack controller module; requires V6081
<b>V6081</b>	Rack controller (DART)
<b>B067</b>	PC-GUI control software, one per B065