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NETWORK SERVICES

Manual

MEG101AE-R4
VDSL2 Mini Modem

Dear customer,

thanks for purchasing MEG101AE-R4, the new release of our successful MEG101 series. Please be noted that the Release 4 is different from previous releases. Therefore this one is not compatible with older releases and not to be used with the older aggregation switches MEG801 series.

Our years of experience in xDSL technology made this product better and more intuitive then other previous xDSL devices from Black Box. The DIP switches are described in a way that makes it easier for you. The maximum bandwidth is now 100Mbps while the latency is lower.

Anyway, as time changes, things are changed. The Release 4 does no longer have the telephony port for transmitting analogue telephony in parallel. Therefore you now get 2 LAN Ports.

If you wish to transmit analogue telephony (or S2M/E1 or ISDN) please contact Black Box. There are ways and devices available to transmit any telephony connection on a working low latency Ethernet Network connection.

For any questions, please feel free to contact your nearest Black Box office. Visit www.black-box.eu for a list of countries and offices and phone numbers and addresses.

D Data   **V** Voice   **H** Hotline

Black Box Worldwide Offices

As well as the Black Box International Subsidiaries listed below, we also have a worldwide network of distributors ensuring efficient shipment of stock and delivery of the right local technical and language support that you need.

Australia	España	Österreich
Belgium + Luxemburg	France	Puerto Rico
Brasil	Italia	Suomi
Canada	Japan	Sverige
Chile	México	Schweiz
Danmark	Nederland	United Kingdom
Deutschland	Norge	United States of America

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Warranty

MEG101AE-R4 is sold with a standard warranty of 12 months. Your local dealer or near Black Box office may have agreed with you to a longer warranty period.

Warranty does not include:

o   Using any other power or power supplies then the original included power supplies
o   Opening the device
o   Changing the device
o   Placing screws or nails with or in or through the device
o   Damages by surge or overpower
o   Damages by heat, water or direct sunshine

If you experience any error or problem, please be sure, Black Box will care for you and the problem. Please contact your local dealer or nearest Black Box office for support. If you are told to send the device for RMA and repair, ALWAYS ship the whole device with power supplies.

Spare power supply for MEG101AE-R4 is Black Box Partnumber KVT127E-PS-R2

Safety warnings

o   DO NOT open the device. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel can service the device.
o   Place connecting cables carefully so that no one will step on them or stumble over them. DO NOT allow anything to rest on the power cord and do NOT locate the product where anyone can work on the power cord.
o   DO NOT install nor use your device during a thunderstorm.
There may be a remote risk of electric shock from lightning.
o   DO NOT expose your device to dampness, dust or corrosive liquids.
o   DO NOT use this product near water, for example, in a wet basement or near a swimming pool.
o   DO NOT obstruct the device ventilation slots or staple the units, as insufficient air flow may harm your device.
o   DO NOT place items on the device.
o   DO NOT use the device for outdoor applications, and make sure all the connections are indoors or have waterproof protection place.
o   Keep the device and all its parts and accessories out of children's reach.
o   Clean the device using a soft and dry cloth rather than liquid or atomizers. Power off the equipment before cleaning it.

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MEG101AE-R4 Setup Steps

MEG101AE-R4 is a Point to Point Ethernet bridge using simple telephony wires as a media. MEG101AE-R4 offers you two LAN 10/100 Mbps Ports. Therefore MEG101AE-R4 is a fully switched L2 device.

To get started, unpack the device. Only use the included power supply. Do not mix this power supply up with power supplies from older MEG101 releases. Followed by unpacking these are your steps to get the line up and running:

a.)   Configure one device to be installed on side A to be the Transmitter (TM)
          Set DIP Switch #1 (Mode) to ON.
b.)   Configure one device to be installed on side B to be the Receiver (RCV)
          Set DIP Switch #1 (Mode) to OFF.
c.)   Leave the other DIP Switches #2 to #4 in factory default (OFF-OFF-OFF)
c.)   Connect your 2 wire route to the LINE Port by either using the RJ11 (middle pins) or the terminal block.
d.)   Connect the power supplies and wait for the LINE LED to light up.

Maybe you experience one or the other of the following:

1.)   If you experience that the line is unstable (LINE LED is on for some minutes, then again off for some seconds, then again on etc…), change DIP Switch #3 (SNRM) to ON. Therefore you need to repower both units.
2.)   If you experience Network dropouts, change DIP Switch #4 (Interleave) to ON. Therefore you need to repower both units.
3.)   If you experience interferences or bad audio quality on nearby telephony transmissions, change DIP Switch #2 (Band) to ON. Therefore you need to repower both units.

The maximum bandwidth of MEG101AE-R4 is 100Mbps symmetrical up to a cable length of 300-400m. How many meters exactly mainly depends on your wire diameter, quality, number of interconnects and more.

The maximum cable length of MEG101AE-R4 is up to 3000m (good and thick cables). But for longer cables (>300-400m) the bandwidth is lower and asymmetrical. See page 13 for a performance/reach table.

Avoid using telephony RJ11 ribbon cables. These cables are built with using very low diameter stranded cables. Using them will mean that bandwidth is lower and reach is shorter!

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What does Interleave mean?

This feature is used to protect the transmission and the stability of the connection against crosstalk issues. Crosstalk is coming from signals on other cables. With the Interleave feature your connection and transmission is getting more reliable.

Without Interleave through noise caused by crosstalk you may loose a certain amount of data. This leads to a re-request of data, which slows down your overall bit rate and net bandwidth. With a lot of lost data packets you may also loose synchronization between transmitter and receiver.

Interleaving is a method of taking data packets, chopping them up into smaller bits and then rearranging them so that once contiguous data is row spaced further apart into a non contiguous stream. Data packets are re-assembled into the right order of data by the receiver.

FAST

Raw data stream

Sudden burst of Noise
causing errors

INTERLEAVED

Interleaved data stream

Re-assembled stream

If your line is particularly susceptible to bursts of noise then interleaving should improve your VDSL experience. Noise on the line caused by crosstalk will not damage a complete block of data, but parts of data blocks, which can be re-assembled by CRC.

Note: Higher interleave means higher latency.

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What does SNRM mean?

This means the Signal to Noise ratio. Any xDSL device puts a signal on a cable which degrades with every meter and kilometre of cable. The degradation comes from noise produced by other signals on nearby cables, by high power devices (elevators), by smartphones (EMI) and other wireless devices.

At the end the signal of the xDSL device has a certain strength in comparison to the noise. You can compare this with two people talking being in an empty room talking (no noise) or two people talking in a disco (high noise).

Many xDSL devices adopt themselves in term of bandwidth and modulation. The better the signal in comparison to the noise comes through, the higher the bandwidth can be.

Setting the MEG101AE-R4 to a higher SNRM of 9db means that the modem will synchronize the line with a spare of 9db budget. If you experience high EMI at your installation a higher spare budget means more stability but less bandwidth.

What does DIP Switch #2 do?

The factory default setting is to have DIP Switch #2 to OFF position. This is good for long/bad cables (and for short/good cables too). A different frequency spectrum is used whether you have DIP Switch #2 to ON or OFF position.

|		
DIP Switch #2 ON	for short/good cables	500kHz to 30MHz
DIP Switch #2 OFF	for long/bad cables	25kHz to 30MHz

In mode "for long/bad cables" the modem completely autodetects cable length. The complete frequency spectrum can be used. In mode "for short/good cables" just a part of the frequency spectrum is used. That mode also allows maximum bandwidth, but the frequencies from ISDN/telephony nearby cables are not touched and used. That reduces EMI interferences.

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VDSL Switch / Aggregation device?

MEG101AE-R4 works together with the VDSL2 Switch MEG821AE.
Using these makes this system an ideal solution for delivering cost-effective, high-performance broadband/multimedia services to Multi-Dwelling Units (MDU) and Multi-Tenant Units (MTU) environments such as hotels, campus, hospitals and telecom.

The switches provide an RS-232 Console Interface for configuring your VDSL system. You need a serial crosscable and a Terminal program to use the serial port with 9600bps 8N1. The default login of the VDSL Quadband Switches is admin (Username) and 123 (Password). The Quadband switches provide Webbased Management and full SNMP.

For a fully functional VDSL system using the VDSL2 Switches you need to configure MEG101AE-R4 to be Receiver only.
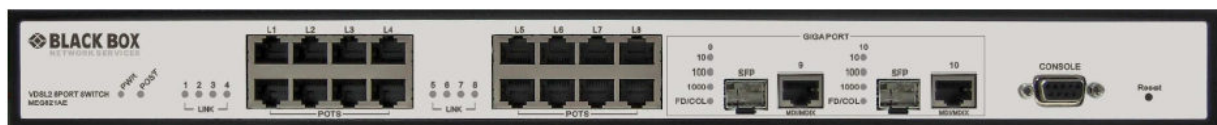
What else is available?

There is also an industrial version MEG250AE available. MEG250AE has an IP30 chassis, 4 LAN Ports 10/100 and an extended temperature range. MEG250AE is for DIN-Rail mounting and for DC powering from 12 to 48V DC. MEG250AE also has an alarm relay contact.

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Installing the Modem MEG101AE-R4
Hardware Installation

MEG101AE-R4 can be used for any indoor, dry and well temperated environment.
Watch out to not exceed the temperature range. This may also be possible by stapling the
MEG101AE-R4 which is not allowed and should not be considered.

The Modem should be located in a cool dry place, with at least 10cm/4in of space
at the front and back for ventilation.
Place the Modem out of direct sunlight, and away from heat sources or areas with
a high amount of electromagnetic interference.
Check if network cables and connectors needed for installation are available
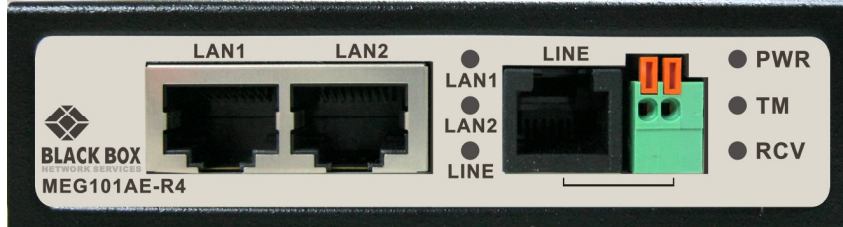
Avoid to use any telephony ribbon cables.
Avoid to use any low diameter cables.
Recommended is at least AWG26, better AWG24.

MEG101AE-R4 is not capable of doing PoE PSE or PD. You may connect PoE
devices, but they will not be powered.

Read page 4 for setup steps.

Front Panel Description:

The front panel shows from left to right:

LAN1/LAN2 Port	Network Ports 10/100Mbps, RJ45, Autonegotation
LAN1/LAN2 LED	Off if no link, On if link and flashing while transferring data
LINE LED	Off if no link, On if linked, Flashing slowly if just synchronizing, flashing fast if transferring data.
LINE Port	2 Wire VDSL2 Connection. Use either RJ11 (middle pins) or Terminal Block, never both. You can use RJ11 on Transmitter and Terminal Block on Receiver side
PWR LED	Off if unpowered, On if powered
TM LED	On if running in Transmitter mode
RCV LED	On if running in Receiver mode

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Rear Panel Description:
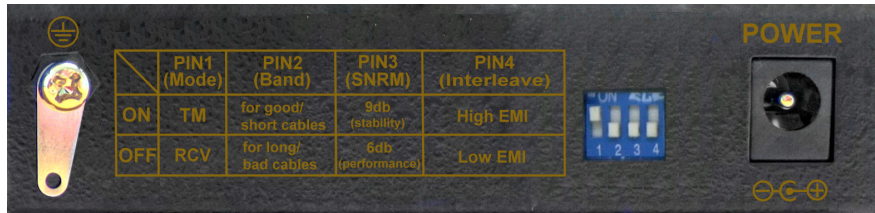
The rear panel shows from left to right:

Ground Clip	Connect to ground/earth. The surge protection inside MEG101AE-R4 can only work with a proper ground connection on both sides.

DIP Switches	No.	Function	ON	OFF
	#1:	Mode	Transmitter	Receiver
	#2:	Band	High Band	Low Band
	#3:	SNRM	9db	6db
	#4:	Interleave	8ms	1ms

See explanation and description of functionality and usage on Pages 4-6 in this manual.

Power	For use with included original power supply. 12VDC/1A
	Spare Power Supply: KVT127E-PS-R2

General Rules

Ethernet Port (RJ-45)
All network connections to the Modem Ethernet port must be made using
Category 5, 5e, 6a or 7. No more than 100 meters of cabling may be used between
the HUB or Computer.

VDSL Port (RJ-11 or Terminal Block)
All connections to the VDSL RJ-11 Port or terminal block must use 24~26 Gauge phone
wiring. We do not recommend using 28 Gauge or above phone line. The active
pins are the two middle pins 2 and 3. To have a clear setup we recommend to have the
VDSL line 1:1 straight through. So, for your notice only, this VDSL device works crossed
and straight through.

VDSL Port RJ-11 Pin out (6 pin wide, 4 pins existing, 2 pins active)

Pin#	FUNCTION
1	Unused
2	**TIP**
3	**RING**
4	Unused

Alternatively to the RJ11 Port you are welcome to use the Terminal Block. Choose to use
either or, do not use both in parallel. The Terminal Block allows you to use simple wires
without crimping a connector to it.

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Some words about xDSL cabling

There are no two cables which are exactly identical. Physics matters for every cable. Of course everybody has concerns about the length of the cable, but that is just an indication.

Once you talk to your customer about the cables, you will get an estimation of the cable length. Watch out for interconnects and ask your customer about them. Every interconnect box influences the main physical factors of the cable:

Impedance and Capacitance

This one is not science, but it gives you some hints and indications. With a good multimeter you should be able to measure the impedance of your cable. The impedance of a telephone wire should be between 50 and 150 Ohm per kilometer (thin cables have high impedance-thick cable have lower impedance)

Disconnect all equipment on Side A and Side B. Then do a short on Side A of the two wires you want to use. Next measure the impedance with a digital multimeter on Side B from wire 1 to wire 2. That value divide by two to get a rough idea of the impedance of your cable. You should also measure the isolation impedance of the cable. Therefore disconnect the short of Side A again and measure from wire 1 to wire 2. The value you get should be several MOhms.

This means, once your customer tells you the route would be 500m long, but your result measuring the impedance is 200 Ohms or more, something is not as it should be. 200 Ohms (this is not science!) equal to a thick cable of 4km or a thin cable of 1km.

If the physics of your cable are within the functional limit of your xDSL device, you get a link, if not, then not. Remember, there is no "small guy" inside any xDSL modem that will run along your cable with a folder rule and say "go" if the wire is x meters long. All is about physics.

Cabling Guidelines and Rules

In general there are four rules about xDSL cabling:

1.)   The thicker the cable, the better
2.)   The weakest part of the cable makes up the quality of the whole
3.)   Watch out for EMI sources
4.)   Use twisted cabling

Rule 1 means that using an AWG24 cable is always better than an AWG28. Watch out for stranded cables. Stranded cables are not as good as solid cables of the same AWG value.

Rule 2 means that one bad interconnect or a few meters of AWG28 cable matters very much, even if the whole rest of the route is thick and good. That´s why you should never use telephony ribbon cables to connect the xDSL modem. That is just like a four lane highway ending up with one lane at the end.

Rule 3: Any device using cables is not happy with EMI and interference. Check the route of the cables. Are they running nearby an elevator or any other device using high power/amps?

Rule 4: Use twisted cabling if available. Twisted cables are better because with not twisted cables the crosstalk effect from other cables and signals is remarkable. Out there are also cables where four wires being twisted together (Quad cabling). Avoid using both cable pairs for the same type of technology.

Compatibility

Which one is compatible with which one?

A   MEG101AE
B   MEG101AE-R2
C   MEG101AE-R3
D   MEG101AE-R4
E   MEG201AE
F   MEG201AE-R2
G   MEG250AE
H   MEG801AE
I   MEG801AE-R2
J   MEG821AE
K   MPG101AE-R2

	A	B	C	D	E	F	G	H	I	J	K
A	Y	N	N	N	N	N	N	Y	N	N	N
B	N	Y	Y	N	N	N	N	N	Y	N	N
C	N	Y	Y	N	N	N	N	N	Y	N	N
D	N	N	N	Y	N	N	Y	N	N	Y	N
E	N	N	N	N	Y	Y	N	N	N	Y	N
F	N	N	N	N	Y	Y	N	N	N	Y	N
G	N	N	N	Y	N	N	Y	N	N	Y	N
H	Y	N	N	N	N	N	N	N	N	N	N
I	N	Y	Y	N	N	N	N	N	N	N	N
J	N	N	N	Y	Y	Y	Y	N	N	N	N
K	N	N	N	N	N	N	N	N	N	N	Y

Of course you always need matching pairs, meaning one Transmitter, one Receiver. MEG801AE, MEG801AE-R2 and MEG821AE are functional as a Transmitter always.

MEG101AE, MEG101AE-R2, MEG101AE-R3, MEG201AE, MEG201AE-R2 and MPG101AE-R2 are either Transmitter or Receiver and can not be changed from one to the other.

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What can I do if my line is too long?

Often there are different routes to get to the "other side". Try to find out if there is another one. If not, Black Box has other xDSL devices that will make you happy.

Please check our Etherlink modems. Check www.black-box.eu for product details, features and more.

Firmware Upgrade

The MEG101AE-R4 units can not be firmware upgraded. The switches MEG821AE can be firmware upgraded by TFTP or RS232. Check the manual of the switches on how to do that.

Tech Support

It is our main philosophy to service you and your needs. If you have any questions please feel free to contact Black Box Free Tech Support. Check www.black-box.eu for phone numbers of your local office.

D Data   **V** Voice   **H** Hotline

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Danmark	Nederland	United Kingdom
Deutschland	Norge	United States of America

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Product Specification

Standard:	IEEE802.3 / IEEE802.3u standard G993.2 VDSL2 standard
Physical Interface:	2 x RJ-45 10/100Mbps autoneg. Ethernet port 1 x RJ-11/Terminal Block connector for VDSL2 line port 1 x DIP Switch 1 x Power Jack 1 x Grounding Connector
Cable Connections:	RJ-45 (Ethernet): Category 3~7 UTP/STP RJ-11 (VDSL2): Twisted Pair phone wire
LED Indicators:	1 x Power LED 2 x Link/Active Status for Ethernet port 1 x Link LED for VDSL2 port 1 x Transmitter Mode indicator LED 1 x Receiver Mode indicator LED
VDSL 2 Line Code:	Discrete multitone (DMT) modulation
VDSL 2 Transmission Mode:	Packet Transfer Mode (PTM)
VDSL 2 Chipset:	Metanoia
Typical Power Consumption:	5 W
Power Requirement:	Input Voltage: 12VDC / 1A (Commercial-grade Power Adapter)
EMC:	EMI Compliant: FCC class B EMS Compliant: CE mark
Operating Temperature:	0°C ~ 50°C (32°F ~ 122°F) Fanless, free air cooling
Storage Temperature:	-20°C ~ 70°C (-4°F ~158°F)
Humidity:	10% to 90% (non-condensing)
Weight:	About 0.34 kg
Dimensions:	95 x 110 x 27 mm (3.74" x 4.33" x 1.06")

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Performance / Reach Table

Test was made with AWG24 simulation cards, Windows XP machines at 26 degrees Celsius. Simulation cards do not simulate EMI, Interference and Interconnects. This means that your results may and will vary.

Using Low Band Spectrum (DIP Switch #2 to OFF)

Cable Length (meters)	US [Mbps]	DS [Mbps]	Cable Length (meters)	US [Mbps]	DS [Mbps]	Cable Length (meters)	US [Mbps]	DS [Mbps]
100	100	100	800	28.58	26.87	2000	2.50	14.92
200	100	100	900	24.12	25.45	2200	2.05	13.36
300	100	100	1000	23.04	22.03	2400	1.94	11.52
400	72.91	73.3	1200	16.81	16.82	2600	1.80	9.01
500	57.09	55.79	1400	12.33	16.53	2800	1.73	7.14
600	46.99	44.25	1600	5.72	15.9	3000	1.65	5.43
700	39.40	32.06	1800	4.65	15.08			

Using High Band Spectrum (DIP Switch #2 to ON)

Cable Length (meters)	US [Mbps]	DS [Mbps]	Cable Length (meters)	US [Mbps]	DS [Mbps]	Cable Length (meters)	US [Mbps]	DS [Mbps]
100	100	100	800	24.60	29.97	2000	8.34	6.07
200	100	100	900	24.12	28.58	2200	5.48	5.72
300	100	90.41	1000	19.14	27.39	2400	3.39	5.27
400	74.06	75.61	1200	14.34	18.51	2600	1.72	4.78
500	52.19	62.39	1400	14.3	13.78	2800	0.71	4.42
600	42.18	44.17	1600	11.11	7.98			
700	37.25	29.76	1800	8.74	7.12			

DS=Download Speed, from Transmitter to Receiver
US=Upload Speed, from Receiver to Transmitter
Mbps rates or not net bandwidth rates.

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DECLARATION OF CONFORMITY

Application of Council Directives(s)   2004/108/EC; 2011/65/EU

Standard(s) to which Conformity is Declared

EN55022:2010; EN61000-3-2:2006 +A1:2009 + A2:2009; EN61000-3-3:2008; EN55024:2010 (IEC61000-4-2:2008; IEC61000-4-3:20006 + A1:2007; + A2:2010; IEC61000-4-4:2004 + A1:2010; IEC61000-4-5:2005; IEC61000-4-6:2008; IEC61000-4-8:2009; IEC61000-4-11:2004; EN50581:2012

Importer's Name   **BLACK BOX NETWORK SERVICES UK LTD**

Importer's Address   *464 BASINGSTOKE ROAD*

Reading, Berks RG2 0BG, United Kingdom

Type of Equipment   *VDSL2 MINI MODEM*

Model Number   *MEG101AE-R4*

Year of Manufacture   *2013*

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Date: *8 April 2013*

(Signature)

Address   *Reading, England*

Peter Brooke Wavell
(Full Name)

Product Manager
(Position)