ScatterBox
.. distributes signals

Instruction Manual

MOD300

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1 Introduction

Most homes still use coaxial cable as a way to distribute TV signals from the aerial to the various TVs within the property. The MOD300 modulator allows you to make the best out of this set up and use it to distribute your home CCTV through this same coaxial cable network.

The MOD300 converts a HDMI output from a DVR (or other equipment such as a Satellite box) into a digital RF signal or “Digital TV channel”. It can then be viewed on a DVB-T equipped TV.

The MOD300 produces a high quality freeview picture far superior to an analogue modulated signal and as most new TVs contain a digital tuner it’s a great way to distribute CCTV in a home or a commercial building via coaxial cable.

The HDMI input to the MOD300 also carries sound alongside the video, so any connected TVs will also be able to playback sound from the DVR or other device too. The MOD300 is also extremely useful for distributing the output from DVRs to multiple “TVs” in commercial environments such as pubs or clubs as it can all be done over low cost coax using an off-the-shelf RF distributor.

Note: The MOD300 has to process and digitise the HDMI input and this creates a delay or “latency” in its output, this is typically in the region of 1 second.

2 User Information

Ensure the power to the modulator is switched off when connecting or removing any cables.

The modulator must be installed in a clean, dry environment where it will not be exposed to high temperatures, moisture or excessive dust.

Do not touch the modulator or any of its connections with wet hands.

Ensure the power is switched off if the modulator is not in use for a long period of time.

There are no user serviceable parts in the modulator and opening or attempting to repair the product will void the warranty.

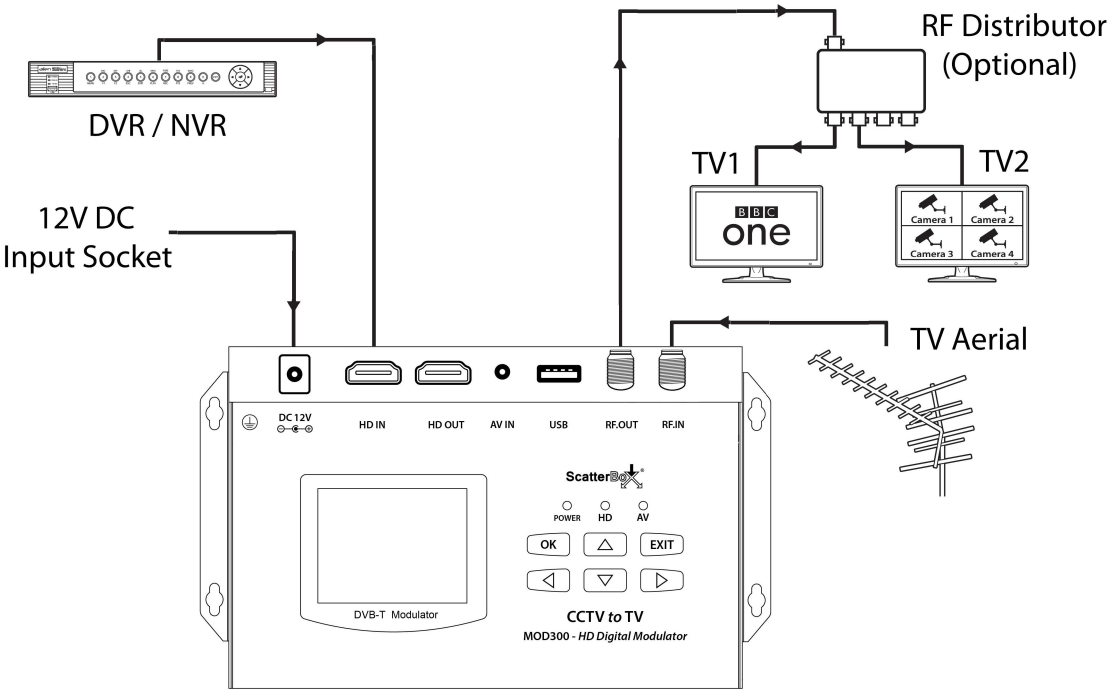
Do not replace the power supply with a voltage greater than 12V DC.

Do not install or use the device if the power cable is damaged.

Do not cover the device with elements that obstruct the ventilation slots.

3 Installation

3.1 Single Unit



1) Remove all the power to the modulator when connecting or removing cables.

2) Connect a HDMI cable from the DVR / NVR (or other video equipment) to the HD IN of the MOD300.

3) When combining the RF signal of a TV aerial and the MOD300, connect the TV aerial coax (f-connector) to the RF.IN port.

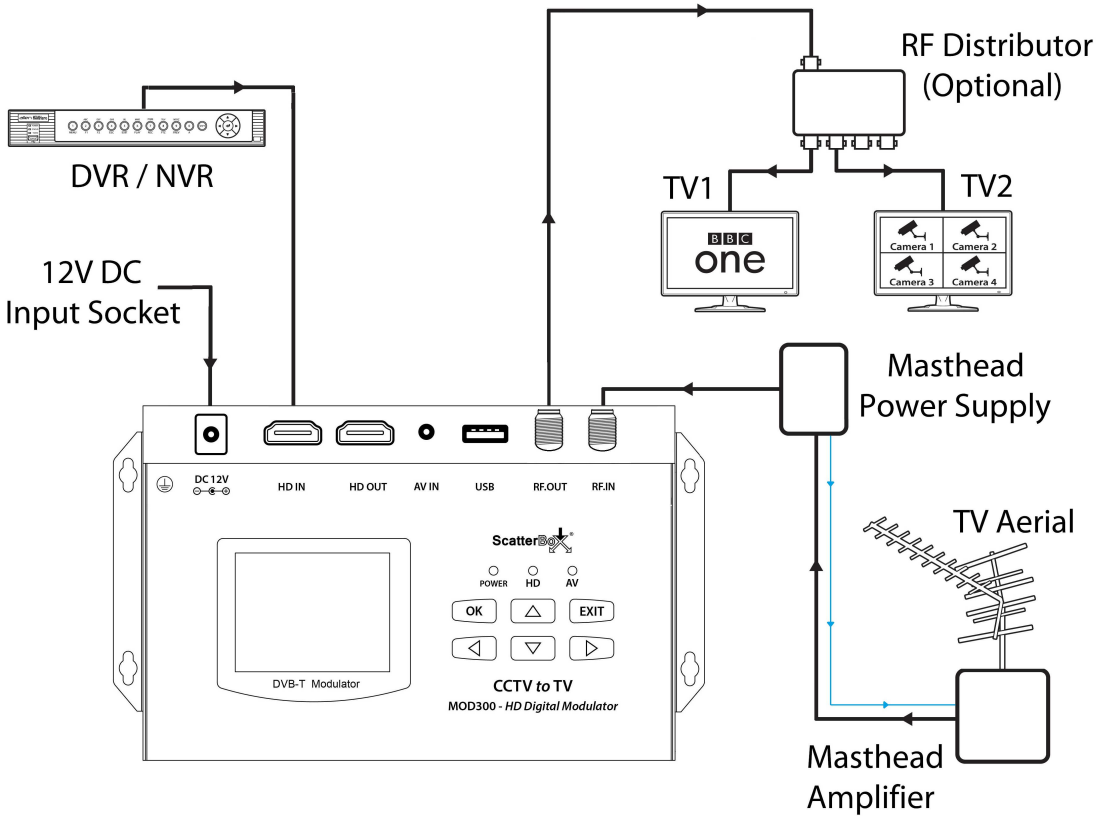
4) Connect a coax (f-connector) to the RF.OUT port direct to a TVs aerial socket or to a distributor to multiple TVs.

5) Connect the 12V DC power supply to the MOD300, then re-tune the TVs.

3.2 Masthead Amp

Although the MOD300 has a built-in combiner (RF IN) you may encounter problems when using a “Masthead” amplifier which is powered remotely up the co-ax, as the MOD300’s internal combiner will not pass this power.

The power for the "Masthead" power supply and amplifier will need to be in line before the RF.IN on the MOD300.



1) Remove all the power to the modulator when connecting or removing cables.

2) Connect a HDMI cable from the DVR / NVR (or other video equipment) to the HD IN of the MOD300.

3) Connect a coax (f-connector) to the RF.OUT port direct to the TV or distributor.

4) Connect a coax (f-connector) for the TV aerial signal to the RF.IN port.

4) Connect the 12V DC power supply to the MOD300, then re-tune the TVs.

4 Controls and Menu System

LED Indicators

- Power = On when the power supply is connected
- HD / AV = Indicates the source which it is set (HD is on as default)

Controls

- ▲ ▼ = Increase or decrease the selected parameter / menu
- ◄ ► = Move to the next or previous digit / character
- Ok = Enter the menu system / select parameter / confirm selection
- Exit = Return to the previous menu / cancel selection

The MOD300 has been designed for use in the UK, as standard the channel appears as "SBox" and channel 800 on the TV.

Settings will need to adjusted if using multiple MOD300s or if the default channel is already in use or to change the channel name.

4.1 Menu System

Main Menu	Parameter	Default Value
Display Status	Source	**AUTO** / HD / AV
	Country	**U.K** / User-Defined
	Channel	CH21 ~ CH70 (**Default CH60**)
	Freq (Khz)	Non editable
	BW (MHz)	6 ~ 8 (**Default 8**)
	RF Out	-31 dBm ~ 6 dBm (**Default -31 dBm**)
	Resolution	Non editable
Setup Stream	TSID	**1001**
	ONID	**001**
	Network ID	**30001**
	Net. Name	**Our Network**
	Program ID	**001**
	Program Name	**SBox**
	Provider	**Provider1**
	LCN	**0401**
	PMT PID	**5001**
	Video PID	**6001**
	Audio PID	**7001**
Setup Modulator	Country	**U.K**
	Channel	**CH60**
	Freq (Khz)	**786000**
	BW (MHz)	**8**
	Constellation	**64QAM**
	FEC	**7/8**
	FFT	**8K**
	Guard in	**1/32**
	RF out	**-31 dBm**
Channel Information	01	**U.K.**
	02	**Netherlands**
	03	**Serbia**
	04	**Germany**
	05	**Belgium**
	06	**Hungary**
	07	**Denmark**
Define User Channel	Add Channel	User Edit
	Modify Channel	User Edit
	Delete Channel	User Edit
System Config	Lock Key	Select after Ok, then Exit to Set Password – 8 digits
	Change Password	User Edit
	Set Time-out	Time-out (Default **Never**)
	Reset to Factory	Select Ok and Ok to Reset
	Select Country	**U.K.**
	Select PWR Unit	**dBm** / dBuV
	Set OSD Language	**English**

4.1.1 Stream Menu Explained

Stream Menu

Menu Title	Default	Description
TSID - Transport Stream ID	**1001**	Transport Stream ID must be unique. Multiple channels can be multiplexed on a single frequency. A broadcast transmitter will have an individual TSID and multiplexed channels have individual program ID
ONID - Original Network ID	**2001**	A single value is used for all UK DTT services: **0x233A (9018)**, as registered with DVB in accordance with TS 101 16217.
Network ID	**30001**	Network ID 30001 ((0x7531) Reserved for future use)
Net. Name	**Our Network**	-
Program ID	**4001**	Program ID must be unique or the TV will see new unit as retuned channel
Program Name	**SBox**	Program name must be unique or the TV will see new unit as retuned channel. This will apear on TV so should be your descriptive title
Provider	**Provider1**	-
LCN - Logical Channel Number	**0401**	0401 will cause the TV to assign channel 800 0402 will cause the TV to assign channel 801
PMT PID - Program Map Table Packet Identification	**5001**	-
Video PID - Video Packet Identification	**6001**	Video PID must be unique to the video stream especially when multiplexing 1 frequency
Audio PID - Audio Packet Identification	**7001**	Audio PID must be unique to the video stream especially when multiplexing 1 frequency
Bitrate	**10 Mbit/s**	-

4.1.2 Modulator Menu Explained

Menu Title	Default	Description
Country	**U.K**	Country will be determined by TV country of operation
Channel	**CH60**	Channel number
Freq (Khz)	**786000**	Channel Frequency will correspond to channel number
BW (MHz) - Bandwidth	**8**	Bandwidth of the sub carrier
Constellation	**64QAM**	Quadrature Amplitude Modulation Type of modulation for digital signals *(DVB-C and -T)*. Two signal components I and Q are each quantized and modulated onto two orthogonal carriers as appropriate for the *QAM* level (4, 16, 32, 64, 128, 256). The *constellation diagram* is obtained by plotting the signal components with I and Q as the coordinate axes. Therefore, 2, 4, 5, 6, 7 or 8 bits of a data stream are transmitted with one symbol, depending on the *QAM* level (4, 16, 32, 64, 128, 256). This type of modulation is used in cable systems and for coding the *COFDM* single carriers.
FEC - Forward Error Correction	**7/8**	Code rate:1/2, 2/3, 3/4, 5/6, 7/8 Used to trade bit rate versus ruggedness, e.g. the signal strength required and interferenceprotection required
FFT - Fast Fourier Transform	**8K**	The DVB-T standard defines two FFT modes to constitute the OFDM signal: 2K – 2048 subcarriers 8k – 8192 subcarriers
Guard in - Guard Interval	**1/32**	The guard interval is a proportion of the time there is no data transmitted between the symbols
RF out - Power Output	**-31 dBm**	The output power should be balanced to obtain a good signal at the receiving unit

4.2 Changing Channel

Changing the channel is relevant if you already have a TV channel populating the channel which the MOD300 is on as default.

The channel number set on the MOD300, doesn't always correspond to the actual channel found on your TV (often it will appear as 800 instead of 401).

Firstly, change the program name - especially relevant when using two modulator to distinguish between the two devices.

LCN - Change in define user channel (logical channel number) - from 401 to something else (For example:- 402)

Program ID - 001 - change to 002.

4.3 Connecting Multiple MOD300s to a TV Distribution System

The main unit (Unit 1) which is the first to connect to the TV coax network shall remain in the default settings and the second unit (Unit 2) shall have its settings altered.

There are different ways to setup an distribution system with multiple modulators, this guide will cover two different configurations.

Configuration 1 - Shows the setup with the modulators both connecting to the combiner in parallel, before then being distributed.

Configuration 2 - Shows the setup with a loop in and out, two modulators in series before a combiner and distributor.

It is recommended to use Configuration 1, this is because when the modulators are connected in series (daisy-chained) there is db signal loss through the RF IN and RF OUT, so to keep the signals balanced it is best to combine all units with a dedicated aerial combiner.

The main unit (Unit 1) which is the first to connect to the TV coax network shall remain in the default settings and the second unit (Unit 2) shall have its settings altered.

TIP - Some aerial splitters work both ways, so they can be used as a combiner instead of a splitter, check the manufacturer for more details.

Additional Modulators

Additional modulators can be combined to provide more TV Signal channels from more devices in the TV Distribution system.

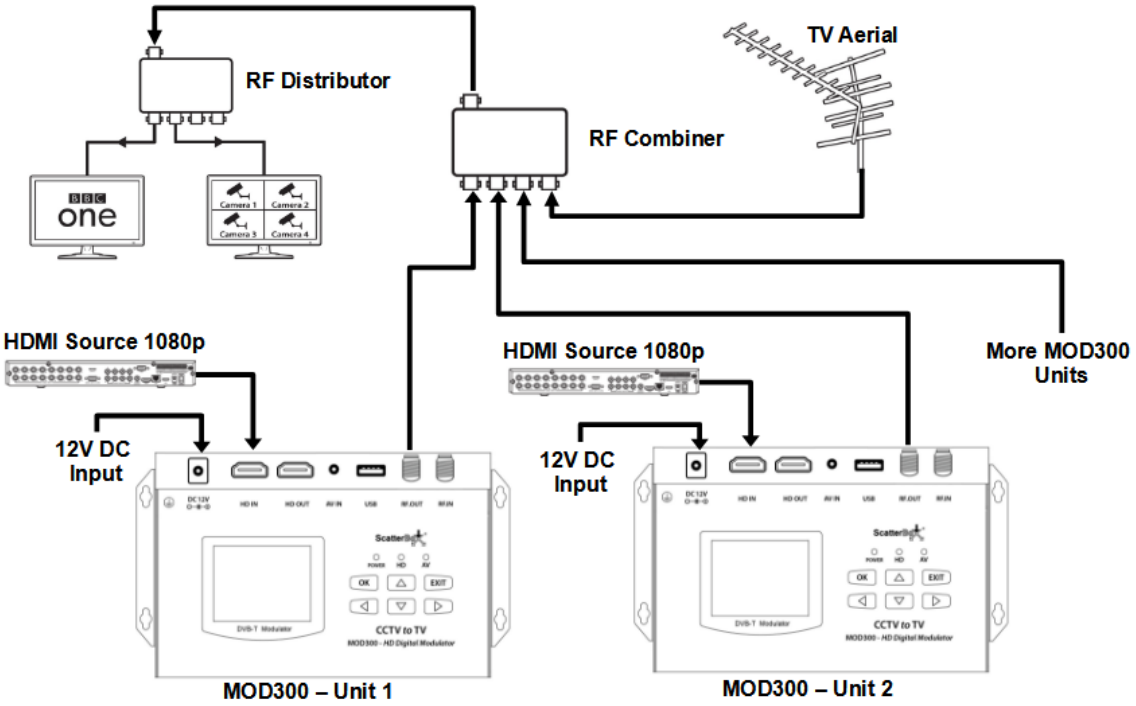
When combining the signals ensure the settings in **bold** are incremented.

The limit on how many additional modulators can be used, is the number of channels that are available to be used and how many aerials can be combined together.

When trying to modulate and combine more than 3 devices together it may be more suitable to be a "Multi Input DVB-T Encoder Modulator".

It is not recommended to use configuration 2 with any more than two modulators, as this will cause too much signal loss.

4.3.1 Configuration 1 - Parallel



Bold shows settings that require changes in Unit 2.

Modulator Menu

Menu Title	Unit 1	Unit 2
Country	U.K	U.K
Channel	CH60	**CH49**
Freq (Khz)	786000	**698000**
BW (MHz) - Bandwidth	8	8
Constellation	64QAM	64QAM
FEC - Forward Error Correction	7/8	7/8
FFT - Fast Fourier Transform	8K	8K
Guard in - Guard Interval	1/32	1/32
RF out - Power Output	-30 dBm	-30 dBm

Stream Menu

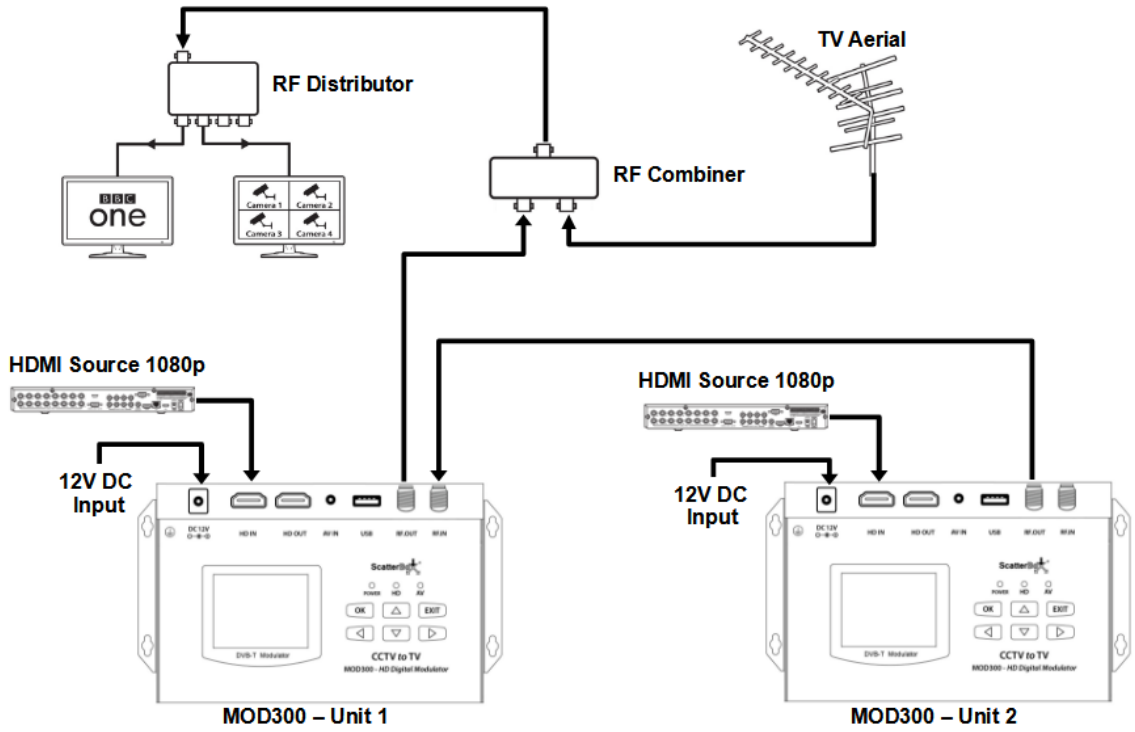
Menu Title	Unit 1	Unit 2
TSID - Transport Stream ID	1001	**1002**
ONID - Original Network ID	2001	2001
Network ID	30001	**30002**
Net. Name	Our Network	Our Network
Program ID	4001	**4002**
Program Name	SBox	**Sbox 1**
Provider	Provider1	Provider1
LCN - Logical Channel Number	0401	**0402**

PMT PID - Program Map Table Packet Identification	5001	**5002**
Video PID - Video Packet Identification	6001	**6002**
Audio PID - Audio Packet Identification	7001	**7002**
Bitrate	10 Mbit/s	10 Mbit/s

Once the above settings have been altered then install the modulators using the below configuration, we recommend following the below steps;

1. Install Unit 1 to the system (including the TV aerial)
2. Tune the TV
3. Install Unit 2
4. Tune the TV again

4.3.2 Configuration 2 - Series



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Modulator Menu

Menu Title	Unit 1	Unit 2
Country	U.K	U.K
Channel	CH60	**CH49**
Freq (Khz)	786000	**698000**
BW (MHz) - Bandwidth	8	8
Constellation	64QAM	64QAM
FEC - Forward Error Correction	7/8	7/8
FFT - Fast Fourier Transform	8K	8K
Guard in - Guard Interval	1/32	1/32
RF out - Power Output	-30 dBm	**-10 dBm**

Stream Menu

Menu Title	Unit 1	Unit 2
TSID - Transport Stream ID	1001	**1002**
ONID - Original Network ID	2001	2001
Network ID	30001	**30002**
Net. Name	Our Network	Our Network
Program ID	4001	**4002**
Program Name	SBox	**Sbox 1**
Provider	Provider1	Provider1

LCN - Logical Channel Number	0401	**0402**
PMT PID - Program Map Table Packet Identification	5001	**5002**
Video PID - Video Packet Identification	6001	**6002**
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Bitrate	10 Mbit/s	10 Mbit/s

Once the above settings have been altered then install the modulators using the below configuration, we recommend following the below steps;

1. Install Unit 1 to the system (including the TV aerial)
2. Tune the TV
3. Install Unit 2
4. Tune the TV again

4.3.3 Channels and Frequencies

UHF Channel Number	Centre frequency (MHz)
21	474
22	482
23	490
24	498
25	506
26	514
27	522
28	530
29	538
30	546
31	554
32	562
33	570
34	578
35	586
36	594
37	602
38	610
39	618
40	626
41	634
42	642
43	650
44	658
45	666
46	674
47	682
48	690

700MHz clearance frequencies (Mobile band 28, centre gap band 67)	
UHF channel number	Centre frequency (MHz)
49	698
50	706
51	714
52	722
53	730
54	738
55 COM7 SFN / Centre Gap	746
56	754
57	762
58	770
59	778
60	786

4G at 800 MHz (Mobile band 20)	
UHF channel number	Centre frequency (MHz)
61	794
62	802
63	810
64	818
65	826
66	834
67	842
68	850

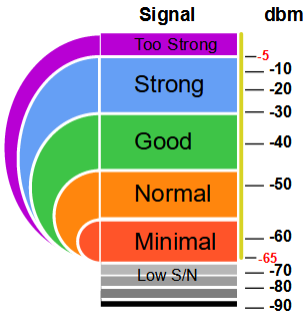
4.3.4 dB Attenuation and Signal Loss

TV - Receiver Dynamic Range

Most TV / DVB-T Receivers have a signal range of -65 to -5dBm.

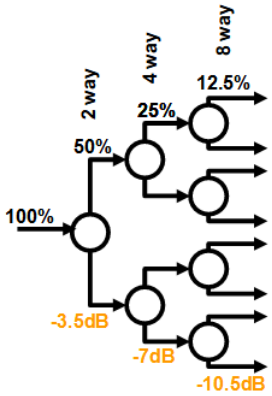
This also corresponds to bars (signal strength bars) which display on a receiver.

Bars	Signal	dBm	Percent
0 bars	Low S/N	< -65	
1 bars	Minimal	-65 to -55	0 to 17%
2 bars	Normal	-55 to -45	17 to 33%
3 bars	Good	-45 to -30	33 to 58%
4 bars	Strong	-30 to -5	58 to 100%



Passive Splitters

On passive splitters there is a signal loss that occurs depending on many ways the signal is being split. So it is important to be aware of this, as this may cause enough signal loss to reduce the signal at the TV.



Signal Loss

Both outputs connecting into passive or active splitter will create a more balanced system as the increased 10dBm is not necessary
Configuration 1 - Parallel 11

There is 10dbm attenuation (signal loss) when 2 devices are looped. Power needs to be increased to compensate, see Configuration 1
Configuration 2 - Series 13

5 Troubleshooting

5.1 Problem - Not appearing as a digital TV channel

Cause - RF level too high or too low - If the RF level is too high or low and the TV can not produce an image.

1. Adjust the RF out level in the MOD300, go to :-

Setup Modulator > RF out. See the Menu System 7 - NOTE if the MOD300 is dBm level range is -31 dBm ~ 6 dBm

This can be adjusted on a trial and error process so you may have to try various RF levels checking the result each time.

It is recommended to adjust the dB level in segments of 3.

Re-tune the TVs after making the adjustment.

2. Check the RF output level of the MOD300 compared with the TV aerial signal using a digital TV (DVB-T) signal strength finder.

The TV may not be able to decode the MOD300 if there is a large difference in strength between the two signals.

Cause - Amplifier installed between the modulator and the TV - The MOD300 does not support AC/DC pass through so the voltage is blocked out.

When using a masthead amplifier it must be installed after the MOD300. See the Masthead Amp 5 installation.

Cause - Incompatibility - The MOD300 outputs video as MPEG-4. Ensure the TV supports MPEG-4 as some TVs only support MPEG-2.

5.2 Problem - TV channel detected but no image displayed

Cause - Resolution from input device not supported by TV - The MOD300 outputs the same resolution as it receives.

For example, if the resolution from the original input device is 1080p the MOD300 will output a 1080p signal.

If the TV only supports a maximum of 720p the new channel will still be discovered but no image will be displayed.

In this case change the resolution of the input device to one which the TV supports.

Cause - RF level too high or too low - If the RF level is too high or low and the TV can not produce an image.

1. Adjust the RF out level in the MOD300, go to :-

Setup Modulator > RF out. See the Menu System 7 - NOTE if the MOD300 is dBm level range is -31 dBm ~ 6 dBm

This can be adjusted on a trial and error process so you may have to try various RF levels checking the result each time.

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The TV may not be able to decode the MOD300 if there is a large difference in strength between the two signals.

6 Specification

Video	Encoding	MPEG-4 AVC/H.264
	Resolution	1920*1080p at 60Hz, 1920*1080p at 50Hz, 1920*1080i at 60Hz, 1920*1080i at 50Hz, 1280*720p at 60Hz, 1280*720p at 50Hz
	Aspect Ratio	16:9, 4:3
	Bitrate	1.000~18.000 Mbps
Audio	Encoding	MPEG Layer 1
	Sample rate	48KHz
	Bitrate	64, 96, 128, 192, 256, 320kbps
CVBS Encoding	Input	PAL, NTSC
DVB-T Modulator Section	Standard	DVB-T COFDM
	Bandwidth	6M, 7M, 8M
	Constellation	QPSK, 16QAM, 64QAM
	Code rate	1/2, 2/3, 3/4, 5/6, 7/8
	Guard interval	1/4, 1/8, 1/16, 1/32
	FFT Carrier Mode	2K, 8K
	MER	30dB
	RF Frequency	177 ~ 858 MHz
	RF Output	0~ +6 dBm
General	Insertion Loss	-3dB
	Language	English
	Firmware	Upgradable Via USB
	RF In / Out	F-Connector
	Power supply	12V DC 2A Plug-in (Supplied)
	Operating temperature	5°C ~ 45°C
	Dimensions	(H)45mm x (W)198mm x (D)111mm

7 Conditions

All specifications are approximate. System Q Ltd reserves the right to change product specifications or features without notice. Whilst every effort is made to ensure that these instructions are complete and accurate, System Q Ltd cannot be held responsible for any losses, no matter how they arise, from errors or omissions in these instructions, or the performance or non-performance of the equipment refered to.

This symbol indicates that equipment must not be mixed with general household waste. For treatment, recovery and recycling please return to your local designated WEE/CG0783SS collection point as defined by your local council.