MELD TECHNOLOGY

MT300
Pico Broadcaster
Version 1.4

OPERATOR MANUAL

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1. Preface

This document provides operator information on how to set up the MT300 (Ethernet to Broadcast) Pico Broadcaster. This device requires professional installation and the use of tools and procedures for determining location, minimum power requirements.

2. IMPORTANT NOTICES

FCC Part 15 Information to the User

Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the rules for TV bands devices, pursuant to part 15 of the FCC rules. These rules are designed to provide reasonable protection against harmful interference. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. 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:

(1) Reorient or relocate the receiving antenna.
(2) Increase the separation between the equipment and receiver.
(3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
(4) Consult the manufacturer, dealer or an experienced radio/TV technician for help.

RF Exposure

The radio described in this manual transmits RF energy. The concentrated energy from the antenna may pose a health hazard. All antennas used with this radio must be installed to provide a minimum separation from all persons of 40 cm (15.7 inches). The above separation distance must be maintained at all times. More information can be obtained from the FCC at the following website:
 http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf

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3. Introduction

The Meld Technology MT300 White Space radio must be professionally installed by a trained installer. The installation must be in accordance with 47 CFR Part 15 Subpart H and the instructions contained in this manual. Only the following components are approved for use with the radio.

Power Supply: **Stontronics 3A-401WP12**
Antenna: **U Tek Technology Co. EA-79X-1**

3.1 Overview

MELD develops Pico Broadcast products for wirelessly distributing content to any DTV ever made for the North American market using newly opened white space frequencies and broadcast standard modulation methods.
The advantages of Personal Broadcast based solutions are:
- Lower cost labor for installation, modification and support
- Economy of scale using standard DTV receivers and components verses other specialized non-standard receivers and communication methods.
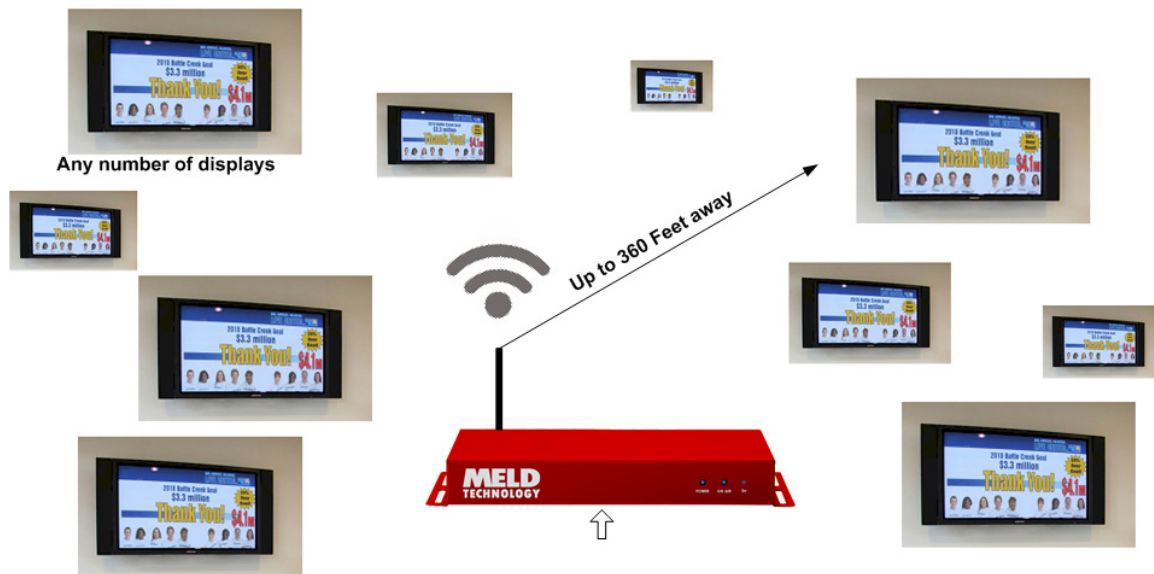
MELD's Pico Broadcaster sends live full HD content wirelessly to any number of DTVs located in an unobstructed effective range of 360 feet, about the size of a football field. No cabling or infrastructure equipment investment needed.
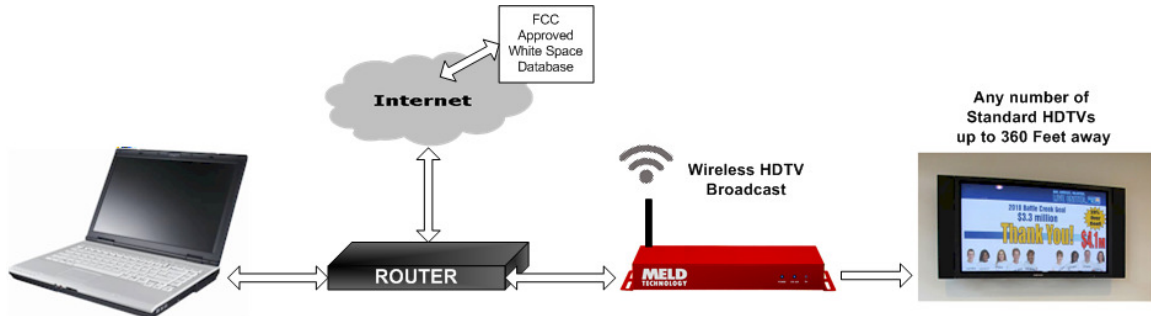
3.2   General Description

**Figure 1 - Typical Setup for Device configuration and TVWS access**

The MT300 is an easy to use Fixed TV bands device using a VSB modulator that is designed to provide low-power transmission of a DTV compatible signal over a limited area.   It is designed to not interfere with licensed broadcast transmissions and complies with the FCC CFR 47 Part 15 subpart H rules for TV Band devices. It is designed to work with the tuner input of any Digital TV sold in North America. The MT300 is designed to accept properly formatted MPEG2 transport streams from a local PC running VLC or similar streaming software or a media server. The transmitted signal is compliant with the tuner input of a Digital TV receiver.

3.4   Intellectual Property Warning

Some of the concepts described in this document are protected by appropriate patent protections or other legal means. These areas are identified in the text as being proprietary. For additional information on these subjects please contact MELD directly.

The device described herein is protected by US Patent #8,063,996, other patents pending.

3.5   System Architecture
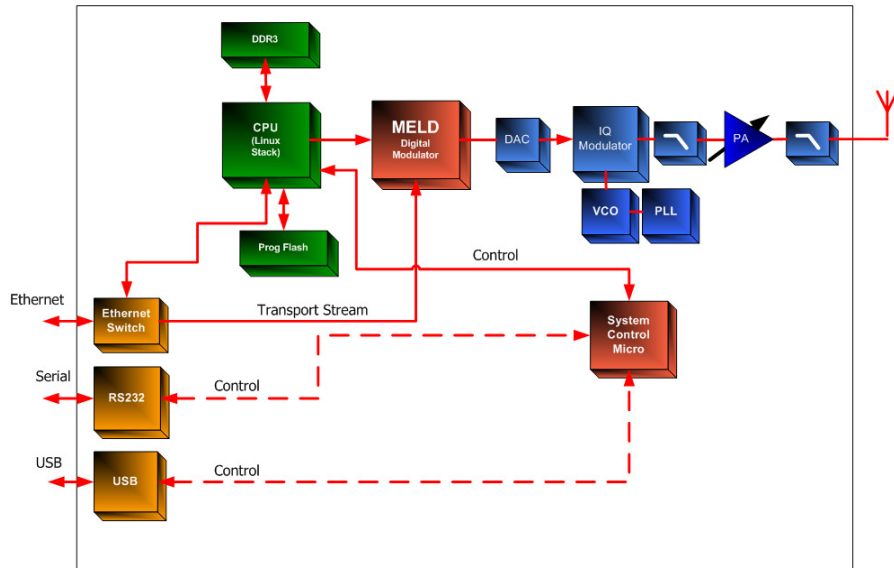
The device has two IP address:

System Control CPU (default)

IP address: 192.168.1.194,
Gateway IP: 192.168.1.254

This address points to a web form used for user registration and setting up the
radio for FCC compliant operation including database access, and radio control
for operational parameters of the system, such as preferred channels and power.

Digital Modulator (default IP address)

IP: 192.168.1.193
Port: 5002

This IP address is for Transport Stream content going directly to the MELD
Digital Modulator for ATSC modulation.

3.6   Applications in Digital Signage

Pico Broadcast HD video distribution would enable airports, hotels, restaurants, bars, schools, hospitals, professional, industrial applications to wirelessly send high-quality video to any number of screens.

- Proven reliable: Used around the world; day in, day out, digital broadcast TV reliably sends perfect clear HD images and sound over large areas.
- Completely wireless: No messy wires run, hide or trip over.
- No external box need: Signal is 100% compatible with any DTV ever built.

3.7   List of abbreviations

ATSC is the Government "Standard" for the Digital (RF) Broadcast Signal

8VSB is the name of the modulation standard used in ATSC Systems
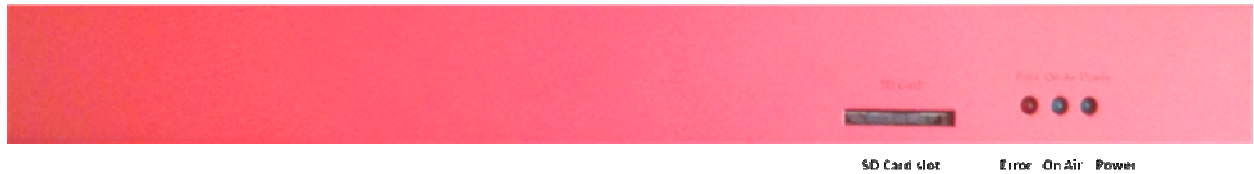
SMPTE 310M is the electrical interface that carries MPEG-2 transport streams to 8VSB modulators

PSIP is the name of the "table" structure that defines the structure and order of the MPEG Streams in a valid broadcast stream ... per government regulations of USA
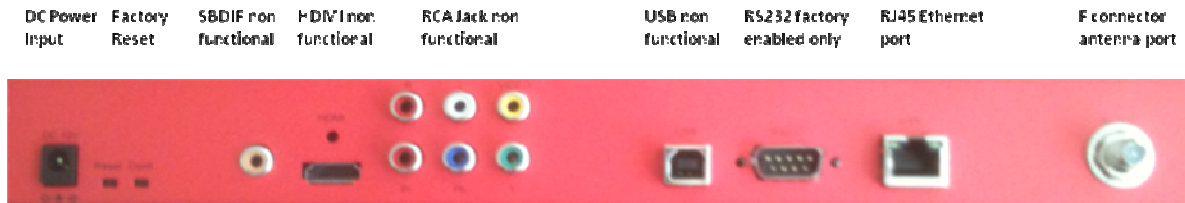
4.   Installation

4.1   Front/Rear Panel Interface

Front Panel

SD Card slot   Error On Air Power

Rear Panel

DC Power Factory   SBDIF non   HDIVI non   RCA Jack non   USB non   RS232 factory   RJ45 Ethernet   F connector
Input   Reset   functional functional functional   functional enabled only   port   antenna port

Note: It is recommended the MT300 be installed and located in a secure area such as a network closet or operations center. The device must be installed in a location that provides a minimum separation from all persons and the antenna of 40 cm (15.7 inches). Please refer to the RF Exposure warning on page 3.

4.2   Setting up the MT300 for first time use

Recommended Network Setup

Note: The MT300 needs internet access to be able to operate. The transmitter will not be enabled until the device successfully registers with and receives a channel list from the TV Bands database service.

Use of the setup in Figure 1 and configuring the router LAN IP address set to 192.168.1.254 will allow access to the White Space database for registration. Set the computers network setting in Figure 1 to DHCP to acquire an address from the router.

Connect the antenna provided to the RF port located on the back panel of the device.
(Use of a different antenna other than the one provided is prohibited)

Plug-in the power supply adapter supplied with the MT300.
(Use of a different power supply other than the one provided is prohibited)

The MT300 is shipped with the factory default network settings below and are assumed unchanged for the recommended network setup.

> **Factory Default Network Settings**
>
> Configuration Type - Static
> IP Address - 192.168.1.194
> Subnet Mask - 255.255.0.0
> Gateway Address - 192.168.1.254
> Primary DNS - 192.168.1.254
> Secondary DNS –
>
> Streaming IP Address – 192.168.1.193

Using your PC internet browser; type http://192.168.1.194 in the browser URL field to access the device webpage interface. The device registration tab will be displayed. To complete the device registration process, proceed to the **Device Registration** section below for registering your device.

Custom Network Setup

Note: Currently, the MT300 only supports network subnets that are limited to 192.168.0.0.

The MT300 is shipped with the factory default network settings above. To change the default network settings to be compatible with your network addressing scheme use the

setup in Figure 1 or use the alternative setup below in Figure 2 to change the MT300 network configuration.

If using the typical setup in Figure 1, connect a PC and the MT300 to the router and set the computers IP Address to a static IP address on the same subnet as the default settings for the MT300 (e.g., 192.168.1.100). The LAN side of the router must be configured for addresses within the 192.168.0.0 subnet.
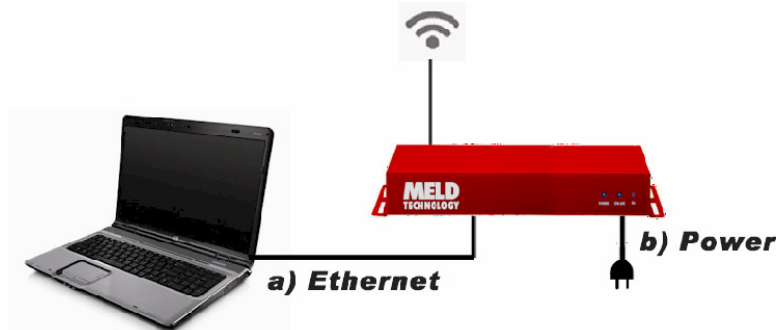

Figure 2 – Alternative setup for device configuration

If using the alternative setup for device configuration in Figure 2, connect a PC to the MT300 Ethernet port and set the computers IP Address to a static IP address on the same subnet as the default settings for the MT300 (e.g., 192.168.1.100).

Using your PC internet browser; type http://192.168.1.194 in the browser URL field to access the device webpage interface. The registration tab will be displayed.

Select the Advanced>Network tabs to display the Network Configuration default values as shown below:

Complete the IP setting fields on the Network tab compatible with your network addressing scheme. Click the Save & Apply button on the bottom of the page.

Note: Depending on the changes made to the IP address configuration, the MT300 may no longer be reachable using the figure 1 and 2 recommended IP address configurations.

Connect the MT300 to a network interface that will allow the device access to the internet. The MT300 needs internet access to be able to operate. The transmitter will not be enabled until the device successfully registers with and receives a channel list from the TV Bands database service.

Using your PC internet browser; type the IP address assigned to the MT300 in the custom network setup http://192.168.x.x in the browser URL field to access the device webpage interface. The device registration tab will be displayed. To complete the device registration process, proceed to the **Device Registration** section below for registering your device.

Device Registration - Registering your device with the White Space Database

Select the White Space Registration tab and complete the White Space Registration form. All fields are required for successful registration. Click on the Save & Apply button on the bottom of the page. This will enable the FCC certified database to authenticate the system and provide white space channels that are available for use in your location. Reference the examples shown below.

Note: Professional installation tools and procedures for determining location must be used to accurately determine the location within +/- 50 m accuracy. Additionally, professional tools and procedures must be used to determine the antenna height. The antenna height input field is expressed in meters AGL.

Registration Screen

NOTE: PRESS SAVE AND APPLY BEFORE GOING TO NEXT SCREEN.

Status Screen

After your device communicates with the database (allow up to 1 minute) the transmitter output will be enabled.   **NOTE:** The transmitter will not output a signal prior to being authenticated by and receiving a channel list from the White Space Registration database.

Advanced Settings

Set the power level to the lowest level required by the application

> The FCC rules for White Space devices require that the minimum transmit power required for reception of the signal must be used. The MT300 transmit power must be adjusted to use the minimum power necessary for reception of the signal. Use the following steps to determine the minimum required transmit power:
>
> **Step 1** - Locate the TV receiver furthest from the MT300 location.
> **Step 2** - Set the power level selection to a value of 1 by using the Power Level pull down menu. (A setting of 1 is lowest available power and a setting of 11 is the highest rated power.)
> **Step 3** - Begin transmission as described in section 5 and adjust the power level setting by increments of 1 until a picture of the transmitted content is viewable on the digital TV.
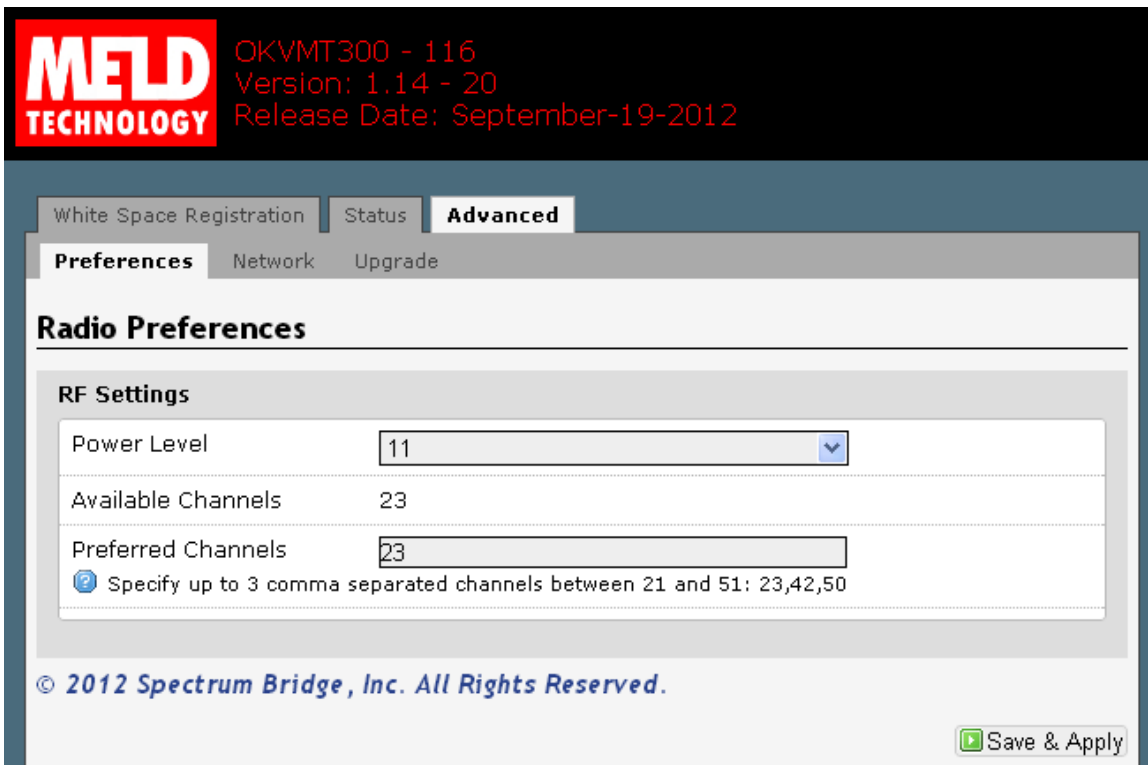
Set the preferred channels

> To select preferred channels from the list of available channels, fill in the Preferred Channels field with the desired channels of operation in order of preference.

4.3   Using your Pico Broadcaster

Station Identification Signal

The FCC requires that Fixed TVBDs transmit identifying information sufficient to identify the device and its geographic coordinates. The MT300 ID signal is transmitted as an ATSC compliant signal that can be received by any Digital TV receiver. The following information is required in the ID message:

> Transmitter Location: 34.34567 N, 119.32487 W
> FCC ID: OKVMT300
> Manufacturer: MELD Technology

Following the steps below the operator is required to stream the identification information for transmission no less than once a day.

Step 1: Create a file containing the required identification identified above.

- Using a video editing system such as Micro Soft Movie Maker or others, create a Title Screen containing 3 lines with the following information:

> Transmitter Location: 34.34567 N, 119.32487 W
> FCC ID: OKVMT300
> Manufacturer: MELD Technology

The location information above is an example only. The location will be unique for each device installation, refer to section 4.2 of this manual to obtain the registration location information for your device

Step 2: Save your file as an MPEG2 standard format file

- Using the video editor render the Title Screen as a 3 second MPEG2 formatted file.

Step 3: Stream the content to the MT300

- Following the instructions in section 5.1 of this manual, stream the MPEG2 file to the MT300. Verify the information is displayed on at least one of the TV receivers tuned to the transmitting channel as shown in the example below:

Transmitter Location: 34.34567 N, 119.32487 W
FCC ID: OKVMT300
Manufacturer: MELD Technology

NOTE: When not streaming content to your MT300, turn off your transmitter by removing power to the device.

5.   Streaming

5.1 Stream content to device

If you are using a Bright Sign box you'll need to refer to their manual.

If you are using a PC you can use the VLC media player as an example. The application can be found here: http://www.videolan.org/vlc/index.html. If you are unfamiliar with VLC media player follow the instructions below. We are currently using VLC for streaming (www.videolan.org). This configuration has been tested using version 1.0.5 and 1.1.11. We suggest you download the latest version, it's free. For more information go to www.meldtech.com/support

Setting up the PC (IP address scheme assumes MT300 factory default settings)

- In a Command prompt window type "IPCONFIG" to view the PC IP address.
      Note: When using direct connection, make sure the PC and MT300 are in the same IP domain. Set the computers IP Address to a static address on the same subnet as the MT300 (e.g., 192.168.1.100)
- in a Command prompt window type "ping 192.168.1.193" (This operation sets up an ARP entry on the PC)
- If properly working the ping command will return "Request timed out" message. This means the Ping command properly saw the MT300 but the MT300 did not respond back, which is to be expected as the MT300 is a one-way streamer and cannot reply. If it says not connected, check physical connection and power MT300.

Make sure ARP table registry is correct
- In a Command prompt window type type "Arp –a"

- You should see the device
Internet Address: 192.168.1.193

If using VLC GUI Streamer Configuration

- Set to RTP streaming mode
- Address: 192.168.1.193
- Port: 5002

Using VLC Streamer Command line

Easy streaming… If you find the navigating the VLC GUI a little tedious we suggest we set up some batch files. (Some examples are provided below.) You could also use VLC with a command line interface via Command prompt window for streaming; it is easier than the GUI interface.

Creating a batch file is a good way to easily and simply broadcast demo content. Of course file locations and stream names may change depending on your computer configuration.

Sample Batch files

Streaming an DVD

What you are doing: Sending DVD stream to 192.168.1.193, port=5002

*** Sample Batch file 1: Broadcasts a DVD ***
Note: It is very easy and convenient to stream DVDs using VLC. (DVDs are a great source for TS material). We suggest you start with this…

Using notepad editor to create BroadcastDVD.bat
"C:\Program Files (x86)\VideoLAN\VLC\vlc.exe" dvdsimple://D:\
:sout=#rtp{dst=192.168.1.193,port=5002,mux=ts} :no-sout-rtp-sap :no-sout-standard-sap
:ttl=1

Streaming an MPEG2 file

What you are doing: Sending an MPEG2 transport stream to 192.168.1.193, port=5002

How to do it: Creating a batch file is a good way to easily and simply broadcast demo content.

*** Sample Batch file 2: Broadcast a few HD files in a loop ***
NOTE! The file MUST be MPEG2 format.

BroadcastHD.bat
"C:\Program Files (x86)\VideoLAN\VLC\vlc.exe"
"C:\Control\worktestvideo\Shuttle.trp" –loop
:sout=#rtp{dst=192.168.1.193,port=5002,mux=ts} :no-sout-rtp-sap :no-sout-standard-sap
:ttl=1 "C:\Control\worktestvideo\Clip4.trp" --loop
:sout=#rtp{dst=192.168.1.193,port=5002,mux=ts} :no-sout-rtp-sap :no-sout-standard-sap
:ttl=1 "C:\Control\worktestvideo\Thunderbirds 480I.mpg" --loop
:sout=#rtp{dst=192.168.1.193,port=5002,mux=ts} :no-sout-rtp-sap :no-sout-standard-sap
:ttl=1

Streaming your PC screen

What you are doing: Sending your PC screen to 192.168.1.193, port=5002

*** Sample Batch file 3: Broadcasts what's on your PC screen.   ***
Note: First set your screen resolution to 1480x720p

Screencast.bat
"C:\Program Files (x86)\VideoLAN\VLC\vlc.exe" screen://
:sout=#transcode{vcodec=mp2v,vb=2000,scale=1}:rtp{dst=192.168.1.193,port=5002,mux=ts} :no-sout-rtp-sap :no-sout-standard-sap :ttl=1

5.2 Tune the TV Receiver

Select "antenna in" on your TV. Make sure you have an antenna attached. Using the keypad, type in the preferred channel selected during the device setup. Example: 23.1. If the TV does not allow you to directly type in a channel, execute a channel scan and then type your preferred channel. Example 23.1

6. Trouble Shooting

6.1 Hardware Setup

If the MT300 is not transmitting the supplied content, the device may be unable to contact the database or the media server may not be configured correctly. You must connect the MT300 to an internet accessible network in order to access the internet for database services. The media providing streaming content to the MT300 must be configured correctly and the TV tuner must be tuned to the correct channel to receive the transmitted content. Refer to the following steps:
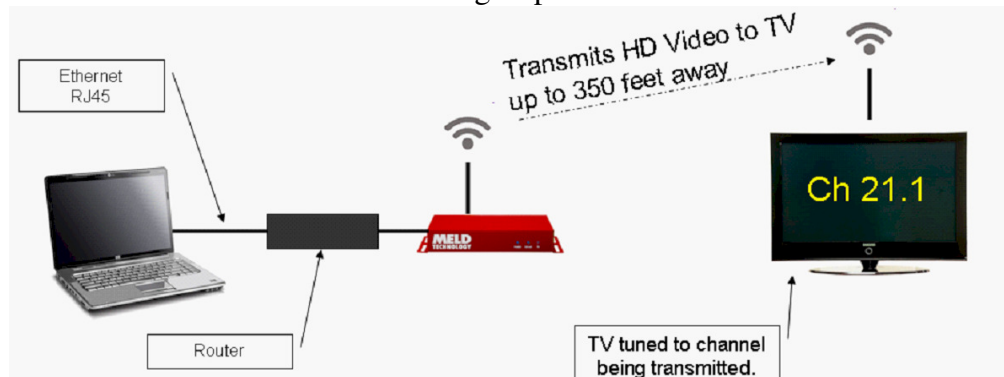
6.2 Set up and test Ethernet connection.

If the "power" LED is not illuminated on the MT300 front panel:
* Verify the power connection is securely plug in on the back panel
* Verify the A/C power outlet that power supply is plugged into.

Check the static address setting on the PC or media delivering the content.

* In a Command prompt window type "IPCONFIG" to view the PC IP address. Note: When using direct connection, make sure the PC and MT300 are in the same IP domain: Set the computers IP Address to a static address on the same subnet as the MT300 (e.g., 192.168.1.100)

If the transmit or "On Air" light is not illuminated on the front panel, verify the MT300 network connection to the TVWS database service.

* Connect a PC to the same local network connection that the MT300 is using
* In a Command prompt window Type "ping tvws.spectrumbridge.com"
* Verify a successful reply from the TVWS service:
    ping tvws.spectrumbridge.com
    Pinging tvws.spectrumbridge.com [204.51.99.33] with 32 bytes of data:
    Reply from 204.51.99.33: bytes=32 time=27ms TTL=242

If the ping reply message times out without a reply, investigate potential network or internet problems.

Check Ethernet connection to the MT300
- in a Command prompt window type "ping 192.168.1.193"
- If properly working the ping command will return "Request timed out" as shown in Fig 1.0. This means the Ping command properly saw the MT300 but the MT300 did not respond back, which is to be expected as the MT300 is a one-way streamer and can not reply. If it says not connected, check physical connection and power MT300.

Make sure ARP table registry is correct
- In a Command prompt window type "Arp –a"
- You should see the device
  Internet Address: 192.168.1.193

Note: If you do NOT see the device you'll need to force the ARP table to map to the IP address to the physical address of the MT300 (i.e. 00 02 03 04 05 06.) Use the second mac addess printed on the label which is located on the bottom of the MT300 case.
ARP command to set ARP TABLE
- in a Command prompt window type   "arp -s 192.168.1.193 00-02-03-04-05-06"

6.3   Tuning the TV Receiver

If you are confident that you have correctly set up the media server and the transmit light on the MT300 is illuminated you may need to repeat the channel scan on you TV receiver.
- Select "antenna in" on your TV. Make sure you have an antenna attached. Using the keypad, type in the preferred channel selected during the device setup. Example: 23.1. If the TV does not allow you to directly type in a channel, execute a channel scan and then type your preferred channel. Example 23.1