

OS

All information taken from - **“Operator guide. IPTV MAG-200 High resolution device.”**

Original documentation: [Operator guide](#)

Example: OS - Ubuntu 12.04 server, STB MAG-200.

[Example of dhcp.conf](#)

All examples are for STB MAG-200.



STB MAG-200 - Option space - **TeleTec**

STB MAG-250 and subsequent models - Option space - **Infomir**

Firmware loading mode by DHCP

STB sends **dhcp-request** with next parameters:

1. `vendor_class_id` - " TeleTecMAG200boot "
2. `dhcp_client_id` - "TeleTecMAG200-XX:XX:XX:XX:XX:XX", где XX:XX:XX:XX:XX:XX - MAC address of the device
3. Section `vendor_spec` contains next options
 1. Version number of the bootloader: `Vernum` - format string "XXX" with leading zero
 2. Date and time: `datetime` - `__DATE__` - `__TIME__`

Having received the **dhcp-answer** the bootloader analyses the presence of options `TeleTec.mcip` and `TeleTec.mcport`. If they are present the bootloader connects to the multicast group specified by these parameters and accepts the image from this group. If these options are not specified the image is loaded according to the protocol **tftp** from the server **next-server** located on the route `filename("mag200/Bootstrap")`.

Thereafter the digital signature of the loaded image is checked using the installed operator key. After the check the image is started specifying the **nfs** section situated at the address specified in the option `"root-path"` as the root file system (the IP of the server should be specified in the beginning of this parameter followed by a colon and the location of the catalogue to be assembled as the root of the file system). The **Bootstrap** ignores the option `"root-path"`.

The contents of the file **dhcpcd.conf**:

- To load **Bootstrap** from multicast group **224.10.0.50:9000**:

```
class "MAG200_boot" {  
    match if (( option vendor-class-identifier="TeleTecMAG200boot" ));
```

```
vendor-option-space TeleTec;  
  option TeleTec.mcip 224.10.0.50;  
  option TeleTec.mcport 9000;  
}
```

- To load **Bootstrap** according to protocol **tftp**:

```
class "MAG200_boot" {  
  match if (( option vendor-class-identifier="TeleTecMAG200boot" ));  
  filename "mag200/Bootstrap";  
  next-server 192.168.1.2;  
}
```

- To load the **kernel** according to protocol **tftp** with the root file system connected via **nfs**:

```
class "MAG200_boot" {  
  match if (( option vendor-class-identifier="TeleTecMAG200boot" ));  
  filename "mag200/uImage";  
  next-server 192.168.1.2;  
  option root-path "192.168.1.2:/srv/mag200/rootfs";  
}
```

The last variant is most often used by integrators for adjusting the program and by operators for checking the image before forming the image for flashing to the device..

File /etc/exports must contain the line: /srv/mag200 *(rw,no_root_squash, sync)

Indication of the basic program loading state

After the switching on the device, the logo, if set, is displayed on the screen while the front panel indicator shows "200". Then the bootloader displays information messages on the loading stages on the TV screen and on the front panel indicator.

Basic program loading stages	Front panel	Messages on the TV screen
Ethernet cable not connected	ErIn	"No link detected!!!"
DHCP request sent	dHCP	"DHCP"
Repeated dhcp request (together with the number of the attempt)	dHCP	"DHCP Retry#"
Dhcp request failed	Er10	"DHCP Error"
Loading the core from mtd4	nand	"Load from nand"
Error when loading the core from mtd4	Er20	"Error loading image from nand"
mtd4 contents not correct	Er20	"Active partition not valid"
Bootstrap from a multicast group	load	"Multicast load"
Bootstrap according to tftp protocol	tftp	"Tftp load"
Digital signature check	chec	"Checking image"
Wrong image format	Er30	"Wrong image"
Wrong digital signature	Er30	"Wrong digital signature"
Core/Bootstrap lauch	GO_	"Loading ..."

Bootstrap

Bootstrap allows to the operator upgrading the basic program stored in the device and performing the necessary settings. Bootstrap accepts, checks and launches the image. This image may be presented by the **bootstrap** signed with operator key installed in the device or by the generally accessible key - (stb_pubbin.key). Standard **bootstrap**¹ consists of the **Linux kernel** and the root file system **RAM**. **DHCP-client** is launched after the **bootstrap**. The **dhcp-requests** of the client contain the option vendor-class-identifier set to the value "TeleTecMAG200boot". If the **dhcp-answer** contains parameter TeleTec.mcip_img and TeleTec.mcport_img, the attempts to load the image prepared by the client are performed from the multicast group TeleTec.mcip_img:TeleTec.mcport_img. The parameter TeleTec.ip_log:TeleTec.ip_port determine the addresses, to which **bootstrap** attempts to send the results of its work. This report can be obtained by issuing, for example the command: nc -l ip_port from the server with c IP - TeleTec.ip_log. **Bootstrap** performs the check of the digital signature of image received using the operator key, if set, otherwise the check is performed with the generally accessible key. Each image subject to upgrading is associated with the following parameters:

- The date of creating the image by the operator. Bootstrap variable - "Image_Date";
- The image version number. It is specified by the operator when creating the image. The bootstrap variable - "Image_Version";
- Short description. The line is set by the operator. The bootstrap variable - "Image_Desc".

Then the version number of the image received is checked. If the image number is higher than the number of the image flashed, no upgrading takes place. If the numbers are equal, the refreshing takes place only provided the item "Image Info"/ "Forced" in the bootstrap menu has been set to "Yes". If the image number is higher, the image is upgraded. After upgrade has succeeded the **bootstrap** variables "Image_Version", "Image_Date" and "Image_Desc", as well as the "NAND" mode are set and the device is re-started. The bootstrap variables "Image_Version", "Image_Date" and "Image_Desc" can be viewed in the **bootstrap** menu "Image Info" or with the utility **fw_printenv**. The process of upgrade is accompanied with displaying corresponding messages on the TV screen.

The contents of the file **dhcpcd.conf**:

```
class "MAG200_upgrade" {
    match if (( option vendor-class-identifier="TeleTecMAG200upgrade" ));

    vendor-option-space TeleTec;
    option TeleTec.mcip      224.10.0.50;
    option TeleTec.mcport    9000;

    option TeleTec.mcip_img  224.10.0.51;
    option TeleTec.mcport_img 9001;

    option TeleTec.ip_log    192.168.1.2;
    option TeleTec.port_log  10000;
}
```

The stages of upgrading the basic program on the device

- Starting the device in the “**DHCP**” mode;
- **Bootstrap** loading from a multicast group or by **fttp**;
- Digital signature check;
- **Bootstrap** start;
- Receiving the image from a multicast group for refreshing;
- Checking the digital signature of the image received;
- Checking the image version number for upgrading;
- Upgrading sections on the device;
- Saving bootstrap variables;

Configuration and organization of the updating process using cyclic multicast group

To configure the system of upgrading images on the device using a cyclic multicast group perform the following steps:

- Adjust **DHCP-server**;
- Adjust the utility **mcsend** for cyclic broadcasting bootstrap and the image to upgrade to multicast group;
- Prepare images for broadcasting;
- Start the utility **mcsend**.

Preparation of images for broadcasting

[Image building for the internal STB software MAG-200/250](#)

DHCP server configuring

When the device is operation according to **dhcp** protocol, it fills the information element `vendor-class-identifier`. The analyses of the protocol allows determining some parameters and settings of the device, they are transferred in the answer of **dhcp-server** and affect the variants of loading and operation of the device.

The example of **dhcpd-server** configuration is shown in the `dhcpd.conf` file.

The options transferred by the information element `vendor-specific` are described in the section “**Description of vendor specifics options**”.

The configuration of cyclic multicast server

Cicular multicast groups can be organized using the utility **mcsend**. The file **mcast.conf** contains the example of configuration, in which two multicast groups are organized. The first one **224.10.0.50: 9000** broadcasts **bootstrap**, the second one **224.10.0.51: 9001** broadcasts **imageupdate**.

mcsend is present in Operators utilities: [Operator Utils MAG-200](#) [Operator Utils MAG-250](#))

The utility with prepared configuration file **mcast.conf** is started by the following command:

```
./mcsend -c ./mcast.conf
```

The description of the update process using cyclic multicast groups

The process of updating the program in the device using cyclic multicast groups consists of the following stages:

- Start of the device in the **"DHCP"** mode. In doing so the device sends a **dhcp-request** from `vendor-class-identifier="TeleTecMAG200boot"` and receives the answer from **dhcp-server** from `TeleTec.mcip` and `TeleTec.mcport`;
- The device receives the image from the multicast group `TeleTec.mcip:TeleTec.mcport` (in this example **224.10.0.50: 9000**);
- The correctness of the digital signature is checked using the operator key;
- The image received is started. In this example it is a **bootstrap**;
- **Bootstrap** is started and sends **dhcp-request** from `vendor-class-identifier="TeleTecMAG200upgrade"` and receives the answer from **dhcp-server** with `TeleTec.mcip_img` and `TeleTec.mcport_img`;
- **Bootstrap** receives the image from multicast group `TeleTec.mcip_img:TeleTec.mcport_img` (in this example **224.10.0.51: 9001**) - this is **imageupdate**;
- The correctness of the digital signature is checked using the operator key;
- The **imageupdate** version number is checked;
- Sections **mttd4** and **mttd5** are upgraded;
- The device is restarted in the **"NAND"** mode.

The description of the programm update process using fixed cyclic multicast groups

To upgrade the program using "fixed" cyclic multicast groups it is necessary to organize cyclic multicast groups with the utility **mcsend** (for example). In this situation the device expects the group **224.50.0.50:9000** to broadcast **Bootstrap**, while the second group **224.50.0.51: 9001** to broadcast **imageupdate**. The addresses of the groups are fixed for this procedure. The file `mcast_mcman.conf` contains the example of configuration which organizes these two multicast groups.

The process of upgrading the program in the device using "fixed" cyclic multicast groups consists of the following stages:

- Organize **Bootstrap** broadcasting at the address **224.50.0.50: 9000** and **imageupdate** broadcasting - at the address **224.50.0.51: 9001**;
- Switch off the device;
- Press the key **"menu"** on the remote control;
- Switch on the device;
- Select the menu item **"Upgrade Image"/"MC Upgrade"**;
- The device receives the image from multicast group **224.50.0.50: 9000**;

- For checking the correctness of digital signature use operator key;
- Start the image received. In this example this image is presented by **Bootstrap**;
- **Bootstrap** starts and receives the image from multicast groups **224.50.0.51:9001** - this is the file **imageupdate**;
- The correctness of the digital signature is checked using the operator key;
- **Imageupdate** version number is checked;
- Sections **mttd4** and **mttd5** are upgraded;
- The device is restarted in the **"NAND"** mode.

With this process the basic program on the device can be replaced without using the protocols **dhcp** and **tftp**, it will suffice to organize broadcasting the required files and initiate the replacement of the basic program.

Vendor-specific options description

Name	Code	Type	Description	Who use
mcip	3	ip-address	IP address of multicast group for kernel/Bootstrap receiving	Bootloader
mcport	4	integer 16	Port of multicast group for kernel/Bootstrap receiving	Bootloader
oppubfile	9	text	Contains the file name, in which prepared operator's key for installation	Bootstrap
mcip_img	10	ip-address	IP address of multicast group for imageupdate receiving	Bootstrap
mcport_img	11	integer 16	Port of multicast group for imageupdate receiving	Bootstrap
mcip_mng	12	ip-address	IP address of multicast group for commands receiving	Firmware
mcport_mng	13	integer 16	Port of multicast group for commands receiving	Firmware
ip_log	14	ip-address	IP address of server, on which Bootstrap can send reports	Bootstrap
port_log	15	integer 16	Port of server, on which Bootstrap can send reports	Bootstrap
logo_x	16	integer 16	Coordinates by x, left-top corner of logo	Bootloader
logo_y	17	integer 16	Coordinates by y, left-top corner of logo	Bootloader
bg_color	18	integer 32	Background color in "XRGB" format for messages while loading	Bootloader
fg_color	19	integer 32	Fonts color "XRGB" format for messages while loading	Bootloader
VerNumber	20	text	Bootstrap version 3 digits with leading zero. Example: substring(option vendor-encapsulated-options,2,3)="002"	Dhcp-сервер
DateTime	21	text	Date and time of Bootstrap creation	Dhcp-сервер
portal_dhcp	22	text	Starting portal, if there is no variables in "portal1" and "portal2" & variable "use_portal_dhcp" doesn't set or has value "true". If the variable "use_portal_dhcp" is set to "false", then it will not used	Dhcp-сервер

Example of dhcpd.conf file

<spoiler|dhcpd.conf>

```
option ntp-servers 10.1.1.1;
option domain-name-servers 10.1.1.1;
authoritative;
```

```

option subnet-mask 255.255.255.0;
default-lease-time 600;
max-lease-time 7200;
allow bootp;

```

```
#####
```

```
# Option for TeleTec
```

```
#####
```

```

option space TeleTec;
option TeleTec.update_url      code 24 = text;
option TeleTec.update_sboot    code 25 = text;
option TeleTec.update_ver      code 26 = text;
option TeleTec.update_mode     code 27 = text;
option TeleTec.portal_dhcp     code 22 = text;
option TeleTec.update_sboot_ver code 28 = text;
option TeleTec.logo_x          code 16 = integer 16;
option TeleTec.logo_y          code 17 = integer 16;
option TeleTec.bg_color        code 18 = integer 32;
option TeleTec.fg_color        code 19 = integer 32;
option TeleTec.mcip            code 3 = ip-address;
option TeleTec.mcport          code 4 = integer 16;
option TeleTec.oppubfile       code 9 = text;
option TeleTec.mcip_img        code 10 = ip-address;
option TeleTec.mcport_img      code 11 = integer 16;
option TeleTec.mcip_mng        code 12 = ip-address;
option TeleTec.mcport_mng      code 13 = integer 16;
option TeleTec.ip_log          code 14 = ip-address;
option TeleTec.port_log        code 15 = integer 16;
option TeleTec.VerNumber       code 20 = text;
option TeleTec.DateTime        code 21 = text;

```

```
#####
```

```
# Option for Infomir
```

```
#####
```

```

option space Infomir;
option Infomir.autostart       code 1 = text;
option Infomir.bootargs        code 2 = text;
option Infomir.mcip            code 3 = ip-address;
option Infomir.mcport          code 4 = integer 16;
option Infomir.oppubfile       code 9 = text;
option Infomir.mcip_img        code 10 = ip-address;
option Infomir.mcport_img      code 11 = integer 16;
option Infomir.mcip_mng        code 12 = ip-address;
option Infomir.mcport_mng      code 13 = integer 16;
option Infomir.ip_log          code 14 = ip-address;
option Infomir.port_log        code 15 = integer 16;
option Infomir.logo_x          code 16 = integer 16;
option Infomir.logo_y          code 17 = integer 16;
option Infomir.bg_color        code 18 = integer 32;

```

```
option Infomir.fg_color          code 19 = integer 32;
option Infomir.VerNumber         code 20 = text;
option Infomir.DateTime         code 21 = text;
option Infomir.portal_dhcp      code 22 = text;
option Infomir.timezone         code 23 = text;
option Infomir.update_url       code 24 = text;
option Infomir.update_sboot     code 25 = text;
option Infomir.update_ver       code 26 = text;
option Infomir.update_mode      code 27 = text;
option Infomir.update_sboot_ver code 28 = text;
```

BOOT MAG200

```
class "MAG200_boot" {
match if (( option vendor-class-identifier="TeleTecMAG200boot"));
filename "mag200/uImage";
next-server 10.1.1.1;
option root-path "10.1.1.1:/srv/mag200";
option ntp-servers 10.1.1.1;
vendor-option-space TeleTec;
}
```

```
class "MAG200_vendor" {
match if (( option vendor-class-identifier="TeleTecMAG200"));
next-server 10.1.1.1;
option ntp-servers 10.1.1.1;
vendor-option-space TeleTec;
option TeleTec.portal_dhcp
"http://10.1.1.1/stalker_portal/c/index.html";
option TeleTec.update_url
"tftp://10.1.1.1/mag200/imageupdate_200_212r2";
option TeleTec.update_ver "212";
option TeleTec.update_sboot "http://10.1.1.1/mag200/SbootIm_038_200";
option TeleTec.update_sboot_ver "038";
option TeleTec.update_mode "tftp://10.1.1.1/mag200/Bootstrap_200_212r2";
}
```

BOOT MAG250

```
class "MAG250_boot" {
match if (( option vendor-class-identifier="InfomirMAG250boot"));
filename "mag250/uImage_mag250";
next-server 10.1.1.1;
option root-path "10.1.1.1:/srv/mag250";
option ntp-servers 10.1.1.1;
vendor-option-space Infomir;
}
```

```
class "MAG250_vendor" {
match if (( option vendor-class-identifier="InfomirMAG250"));
```



```

next-server 10.1.1.1;
option ntp-servers 10.1.1.1;
vendor-option-space Infomir;
option Infomir.portal_dhcp
"http://10.1.1.1/stalker_portal/c/index.html";
option Infomir.update_url
"tftp://10.1.1.1/mag250/imageupdate_250_212r2";
option Infomir.update_ver "212";
option Infomir.update_sboot "http://10.1.1.1/mag250/SbootIm_mag250";
option Infomir.update_sboot_ver "007";
option Infomir.update_mode "tftp://10.1.1.1/mag250/Bootstrap_250_212r2";
}

##### NETWORK #####

subnet 10.1.1.0 netmask 255.255.255.0 {
option subnet-mask 255.255.255.0;
next-server 10.1.1.1;
pool {
range 10.1.1.10 10.1.1.254;
next-server 10.1.1.1;
option ntp-servers 10.1.1.1;
}
}

```

</spoiler>

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