# HD490 AFD Software

## Modular Add-On for HD490 Closed Caption Encoder

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# 1 Introduction

## 1.1 System Overview

The EEG HD490 AFD Software is a flexible and versatile module running on the HD490 Closed Caption Encoder that encodes and recovers Active Format Descriptors (SMPTE 2016-1-2007). The HD490 can be used to statically insert any legal AFD code on each video field in HD VANC, or in a privately-defined custom XDS packet in HD or SD. The software also provides low-latency dynamic switching between AFD sources, with configurable priority between upstream encoded data, presets, and a simple network automation protocol. The encoder also features an AFD input/output switching matrix which allows users to pick desired input sources and produce a single consistent AFD packet for each field of the output signal. Additionally, the webtools allow the user to set code swap rules that enable dynamic mapping from one AFD code at the input to another at the output

The HD490 AFD software is ideal for complex broadcast environments requiring continuous AFD data on programming, commercials and interstitials, and more. The switching and data continuity features provide frame-by-frame AFD service confidence, and make the HD490 a key piece in creating an AFD-enabled 100% HD workflow.

## 2 AFD Code Reference

The table below shows the AFD codes that are defined by SMPTE standard for a 16x9 coded frame.

*Table1: AFD codes and meanings*

| **Active Format Description** | **AFD Code** |
|---|---|
| Unknown (assumed same as coded frame) | 0000 |
| Reserved | 0001 |
| Full frame 16:9 image | 0010 |
| Pillarbox 14:9 image, horizontally centered | 0011 |
| Letterbox image, vertically centered | 0100 |
| Reserved | 0101 |
| Reserved | 0110 |
| Reserved | 0111 |
| Full frame 16:9 image | 1000 |
| Pillarbox 4:3 image, horizontally centered | 1001 |
| Full frame 16:9 image, all image areas protected | 1010 |
| Pillarbox 14:9 image, horizontally centered | 1011 |
| Reserved | 1100 |
| Pillarbox 4:3 image, with alternative 14:9 center | 1101 |
| Full frame 16:9 image, with alternative 14:9 center | 1110 |
| Full frame 16:9 image, with alternative 4:3 center | 1111 |

# 3 Using the HD490 AFD Software

## 3.1 Connecting to the Web-based Configuration

Initial configuration of the AFD software tool is accessed through the HD490 web-browser configuration page hosted on your encoder.

1. To access the configuration page, use a standard Ethernet cable on the rear panel to connect your HD490 encoder to your local network.

2. Use the front panel LCD screen and button pad to set the HD490 IP address and subnet mask. These must be valid settings for your network, or you will not be able to communicate with the encoder.

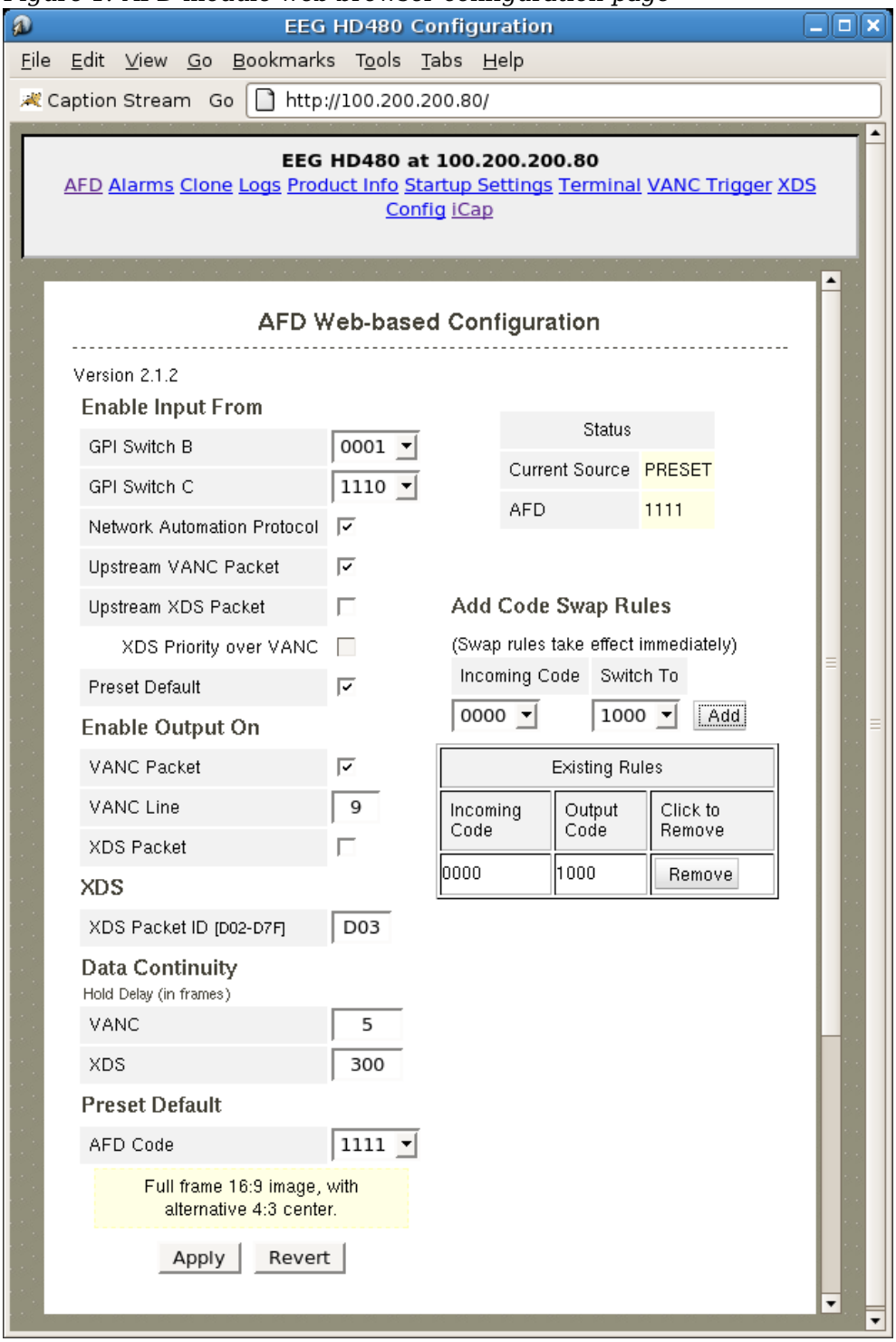
3. Access the encoder's web configuration pages from any PC on the same local network by typing the IP address you assigned to the encoder into a web browser.

4. From the main configuration page, there will be links to all of your installed modules along the top bar. Click the top panel link labeled 'AFD.'

5. The AFD configuration page you will see is shown in Figure 1.

*Figure 1: AFD module web browser configuration page*



## 3.2 Settings on the Configuration Panel

The web-based configuration page controls the input and output behavior of the HD490 AFD tool. You must press the Apply button before any configuration changes take effect. You can press the Revert button at any time to before pressing Apply to cancel the changes that have not gone into effect yet.

### 3.2.1 Input Setup

**GPI Switches**
Use this field to control the AFD function of each of the encoder's GPI switches. If an AFD code is selected, that code will be forced on the output whenever the corresponding switch is triggered. Select 'Off' to reserve a GPI switch for caption relocation or other software modules. For physical and electrical details on the GPI connector, please refer to the HD490 product manual.

**Network Automation Protocol**
Check this box to enable AFD control through the encoder's telnet-style network automation socket. Only codes triggered from the GPI will have higher priority than network automation data. Details on the automation protocol can be found in the Appendix.

**Upstream VANC Packet**
Check this box to enable recovery of upstream encoded AFD codes in VANC. If you uncheck the box all upstream VANC codes are ignored.

**Upstream XDS Packet**
Check this box to enable recovery of upstream encoded AFD codes in XDS. To be recovered, upstream codes must have the same private packet ID listed in the Output Setup packet ID field and be written with a compatible encoder device.

**XDS Priority over VANC**
Check this box to give recovered XDS codes priority over recovered VANC codes when both are present. The default behavior (unchecked) is to give VANC codes priority.

**Preset Default**
Check this box to enable insertion of the static AFD code listed in the Preset Default AFD code field. The preset code has the lowest priority and will be inserted when all other sources of data are either disabled or not active.

### 3.2.2 Output Setup

**VANC Packet**
Check this box to enable insertion of AFD VANC packets on the output video. **If this box is not checked, no VANC data will appear.**

**VANC Line**
This field sets the line number that the VANC data will be inserted onto.

**XDS Packet**
Check this box to enable insertion of XDS packets containing AFD codes on the output video. These will appear on Line 21 of an SD–SDI signal, or in the 608 compatibility region of the EIA–708 CC packets on an HD-SDI signal.

**Packet ID**
This field sets the private packet ID that will be used for both recovery and insertion of AFD XDS packets. This legal range for this hex value is D01 to D7F.

### 3.2.3 Data Continuity

**VANC**
This field sets the number of frames that the HD490 will continue outputting an AFD code from an upstream VANC source if that source stops sending AFD data. This feature can be used to ensure that AFD data will be encoded on every frame at the output even if an upstream source is only encoded on same frames. However, using this feature creates a switching latency between the time when upstream VANC AFD disappears and time when it is replaced in the output by data from XDS or the preset.

**XDS**
This field sets the number of frames that the HD490 will continue outputting an AFD code from an upstream XDS source without seeing any new upstream XDS packets. This feature is critical for use of the XDS recovery feature because XDS cannot be sent on every frame due to Line 21 bandwidth limitations. The hold delay will need to be set to 100 frames or more in many environments. This does create a switching latency between the time when the last XDS AFD packet appears in a stream and the time when that code is replaced in the output signal by data from a preset or VANC (if XDS Priority over VANC is set). Therefore, the hold delay should be set to the lowest value that gives continuous operation in your environment.

### 3.2.4 Preset Default

**AFD Code**
This field selects the AFD code that will be inserted statically when no other source of AFD data is recovered. The text below the selection box gives the definition of the selected code.

### 3.2.5 Status

The status section auto-refreshes approximately once every 2 seconds to provide up-to-date information about the unit.

**Current Source**
This field reports the source of the AFD code that is currently being encoded to the output video signal. You will see one of PRESET, XDS, VANC, TCP (network automation), GPI, TRANSPARENT, or STRIP. If you see TRANSPARENT in the current source window, it means that the upstream VANC is passing through completely unchanged. If you see STRIP in the current source window, it means that upstream VANC is being removed and nothing is being inserted in its place.

**AFD**
This field reports the AFD code that is currently being encoded to the output video signal.

### 3.2.6 Add Code Swap Rules

The code swap rules tool enables dynamic mapping from one AFD code at the input to another at the output. This feature is useful in situations where other equipment has automatically stamped the video signal with undesirable AFD codes, or for any situation in which problematic AFD codes arrive on the signal. If there is no code swap rule specified for a code, the default behavior is to show the code on the output signal whenever it appears on the input signal.

To select the incoming AFD code to be switched, use the drop down list located underneath the Incoming Code label and click on the desired code. Then, use the drop down list located underneath the Switch To label to select the AFD code you would like the incoming code to be switched to. Click on the **Add** button to the right of the two drop down lists to add the code swap rule.

Once a code swap rule has been added, it appears in the table labeled Existing Rules, where the Incoming and Outgoing codes are listed next to each other, followed by a **Remove** button. To delete a code swap rule, go to the line in the table where the swap rule is and click the **Remove** button to the right of the code swap rule.

# A Appendix A

## A.1 Network Automation Protocol

HD490 software modules can be remotely controlled over a network by connecting to TCP port 2300 on the encoder. The messages sent to this port from any automation server must follow the format given in this appendix.

TCP messages sent to the port to control the AFD module should have the following payload format:

- 4 byte integer length (including entire payload)
- 4 byte integer command code of 0x00000001 for AFD module control
- 4 byte integer status code (set to 0x00000000)
- A variable length data string in the format name = value

To control AFD codes, the data string should read "AFD=value", where value is the desired code as a 4 character string, for example:

AFD=1001

This AFD code will then be inserted on every frame until further notice is received from the automation system, in the form of another AFD code, or a command to return to local control.

To cancel the previous automation message and return the AFD code to local control (preset or upstream sources), send a control packet with a "stop" value instead of a valid data string, for example:

AFD=stop

You can also force a return to local control manually by disabling Net-

work Automation on the configuration website. You may then re-start Network Automation if desired, and any previous commands will be reset.

The AFD module will acknowledge every automation command received with a TCP packet of the same format. The 4-byte status code will be set to 0 to indicate success, and a non-zero value to indicate an error in parsing or executing the command. The data string will be empty.