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## 1. General description

### 1.1. Device overview

#### The CW-444x and the CW-454x ASI-IP-ASI Converter family

The CW-444x Series ASI to IP Converter and the CW-454x Series IP to ASI Converter family are built from common boards such as:

- Gigabit Ethernet Controller II - 2 × 64 channel TS transmitter and receiver, with a web interface
- 4 channel ASI Input interface
- 4 channel ASI Output interface
- Power supply and 19" frame

The CW-444x ASI to IP Converter family:



- **CW-4441 ASI to IP Converter** 4×ASI input, 4×IP output, SFP, WebGUI
- **CW-4442 ASI to IP Converter** 8×ASI input, 4×IP output, SFP, WebGUI
- **CW-4443 ASI to IP Converter** 12×ASI input, 4×IP output, SFP, WebGUI

The CW-454x IP to ASI Converter family:



- **CW-4541 IP to ASI Converter** 4×IP input, 4×ASI output, SFP, WebGUI
- **CW-4542 IP to ASI Converter** 8×IP input, 4×ASI output, SFP, WebGUI
- **CW-4543 IP to ASI Converter** 12×IP input, 4×ASI output, SFP, WebGUI

The devices have HTML5 web-based user interface, after the inputs and the outputs are configured, no further control or supervision is required. The device is made for 24h operation.

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## Supplement

The basic parameters of the device (Power Supply level, temperature, up-time, TS port and Management port status, Input data rates) can be checked in the “**Main**” menu on the web-based user interface. The incoming stream can be checked by the built-in Transport Stream analyser.

### *1.2. Software overview*

#### **Web-based user interface**


The Converter devices have a web interface. The software has a universal web interface design. It means, that the software contains both the ASI to IP and the IP to ASI Converters’ GUI. When the GUI is loading the software detects the type number of the device and configure the software according to the device’s type (ASI to IP or IP to ASI), hence the firmware software for the converters is the same. The type number is stored in the Gigabit Ethernet Controller 2 module.

The software has been developed and tested with the Firefox web browser. It can run under other browsers, but in this case there may be greater or lesser differences.

The software has been prepared in accordance with the HTML-5, JavaScript, CSS, and Ajax technologies. Enable JavaScript in your Web browser.

The software also includes Java applet, but this will only be called if the user wants to use this feature. In this case, install the latest version of Java in advance. The Java function must also be enabled in the Web browser.


#### **Software structure**

The software interface consists of various pages. The user is free to decide which pages to open, how deep he wants to view or modify the data. Clicking the  icon always open new surfaces, always new data can be seen.

#### **Data management**

The configuration process changes the current settings, the existing data. The data you can read in the boxes of the software is always the last value read from the device. To change this, enter the box. Then in case of all important data the box will turn yellow. Type in the new data. Pressing the Enter key, you can indicate to the software that you have finished typing and ask for the data processing. The software can also start processing the data when you exit the box. Assumed that the user does not always provide the correct data, so the data processing software types the data deemed it fit in the box and the box colour turns to white again.

## Data Programming

Since the computer is connected to the device via the IP network, the connection between the user interface and the device exists only rarely and for a short time. The data changes implemented at the user interface only affect the device's hardware operation if you click the Apply or Load ... button. To verify the authenticity of the data presented at the interface, click the Refresh icon .

## Storage of data

The software settings and the data required for editing will be stored in a common xml file. The file written in the device and the xml file, which can be saved to PC are completely identical.

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## Supplement

You can simply check the operation of the software data processing, if you type some excess characters after the correct data. For example, when entering the Service Id, you type the 'ggg' characters after the value of 2500, the software will remove the unnecessary characters. For more complex data (e.g. IP Address, MAC Address, etc.) the software will attempt to develop a formally correct data. The missing data will be substituted with 0, FF, etc.

You can simply make sure the reality of data if you delete the data in the box, then ask the software to update the data. When the deleted and updated data match, it was correct data in the box.

## 1.3. Frequently asked questions

### What is the default IP address of the device?

The factory setting of the Management Port IP address is 192.168.10.10 and the Transport Stream Port IP address is 10.123.13.102. On device Reset, the Management Port IP address will be 10.123.13.101, the Transport Stream Port IP address will be 10.123.13.102.

### What if I forgot the IP address of the device?

In case you have forgotten the IP address, you have two options to restore it. If the ARP message sending was on (default is on with 15-second repetition time), then for example the Wireshark program can monitor the network traffic, in which you find the ARP message sent by the device. From this message you can read out the device's IP address. This solution works for both the Management Port and the Transport Stream Port.

The second possibility is to press the **Reset** button between the two RJ45 connectors located on the rear panel, so the unit will return to the default settings. Then the device Management Port IP address will be 10.123.13.101 and the Transport Stream IP address will be 10.123.13.102.

## How to use the Reset button?

The Reset button must be pressed when the device is turned on. The button can be reached through a small hole with a thin stick. When pressing the button the back panel LEDs turn off, then flash indicating the running of the Reset process. The reset time is approx. 5 sec.

## 1.4 TS Analyzer

### General information

The TS Analyzer built into the devices continuously measures the data rate of the 4, 8 or 12 input channels, and shows the results on the surface. By clicking the TS Analyzer menu you can see some of the TS components.

## 2. CW-444x ASI to IP Converter family

### 2.1 Basic Settings

#### Configuration of the output streams


Click to the **Configuration** menu to see the IP output configuration settings. Write the destination IP and port address into the **Destination IP Address:Port Number** input field (ex.: **239.123.13.100:58100**).

A short description can be written into the **Description** input field to help identify the given output. When the settings are saved in the Project menu, these data are also will be saved.


When a valid IP address was set and the Enable checkbox was checked, the device start streaming the content. In case of troubleshooting, the output streaming can be switched off easily by the Enable checkbox.

Click on the **Apply** button to load the settings into the device.


#### Reading out the device settings

Click to the  **Refresh** button to read out the current settings from the device.

#### Fine tuning of the settings

Only the most important settings are visible in Basic mode. Click the  **Option** button the make the advanced settings available.

#### Supplements

The device allows you to configure output data streams according to the needs of a skilled operator. You can reset the custom settings in the Project menu /  **Option** button by clicking the Erase – Load Default Configuration button.

## 2.2. Advanced Settings

### Configuration of the output streams

On the Configuration page clicking to the  **Options** button the following output settings can be set.

**MAC Address:** When the Multicast address is written in the box, the software automatically fill in the MAC Address value. When you want to change this, overwrite the MAC value. In case of Unicast stream, the user must enter the correct MAC address. The device is streaming even if the destination IP/MAC is unreachable.

**TS Packets/UDP:** In the UDP packet usually **7 TS packets** are built, but in many applications it should be changed. Enter the number 7 or different value in the box. Only the values between 1 and 7 will be accepted.

**RTP/(UDP):** In the IP transmission usually 188 byte TS packets are built in the UDP packet. The IP output stage is able to establish the UDP packet according to the **UDP** and the RTP protocol, too. Since the RTP provides little more than the UDP, select the UDP format. The RTP format can be used when your application needs it.

**Remove Scrambled Packets:** check the checkbox **Rem Scramb** to remove the scrambled packets from the stream. The circuit decides on removal from the packet header.

**Remove TEI=1 TS Packets:** check the checkbox **Rem TEI=1** to remove the packets, in which the Transport Error Indicator bit is set to 1. Since the removal of the entire packet causes larger errors in the image and the sound than data errors may occur, so be careful to check this box.


**Remove Null Packets:** check the box **Rem Null** to remove the null packets from in the output stream. Since the null packets unnecessarily burden the IP network, in the majority of applications the null packets are removed.


**VLAN Enable:** check the checkbox to enable VLAN mode. The device inserts a 4-byte tag into the UDP packet according to the IEEE 802.1Q standard.


**VLAN Identifier:** write the desired VLAN identifier into the input field. Only the values between 0 and 4095 will be accepted.

**VLAN Name:** it is a description what helps the user to identify the given VLAN.

The device is capable to copy the selected output stream and send the content to 3 additionally destination IP address.

**MPX 1 Copy to:** the content of the incoming ASI signal can be streamed to another destination. Click to the  **Options** button to set the details.

**MPX 2 Copy to:** the content of the incoming ASI signal can be streamed to another destination. Click to the  **Options** button to set the details.


**MPX 3 Copy to:** the content of the incoming ASI signal can be streamed to another destination. Click to the  **Options** button to set the details.

In case of MPX 1, 2 or 3, the content is the same but the IP settings can be different.

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## Supplements

Click the **Write the Report of Configuration** button to make an overall report in a pop-up window about the settings.

In the Project menu click to the  **Options** button to reach additional VLAN settings like TPID (default: 0x8100), PCP - Priority Code Point, CFI (Ethernet=0).

## 3. CW-454x IP to ASI Converter family

### 3.1. Basic Settings

#### Configuration of Input streams

Click to the **Configuration** menu to see the IP input configuration settings. Write the IP and Port address of the stream you want to receive into the **Destination IP Address:Port Number** input field (ex.: **239.123.13.100:58100**).

A short description can be written into the **Description** input field to help identify the given input. When the settings are saved in the Project menu, these data are also will be saved.


When a valid IP address was set and the Enable checkbox was checked, the device start receiving the stream (start sending out IGMP membership report messages in case of Multicast addressing).

In case of receiving unicast IP stream, the Destination IP address and Port number have to be the device own TS port IP address (ex.: 10.123.13.102:56789).

In case of troubleshooting, the input can be disabled easily by the Enable checkbox.

Click on the **Apply** button to load the settings into the device.


#### Reading out the device settings

Click to the  **Refresh** button to read out the current settings from the device.


#### Configuration of the ASI outputs

Beginner users select the **ASI Output max 72 Mbps** radio button. For more information about the configuration of the ASI output please go to the chapter 3.3.

#### Fine tuning of the settings

Only the most important settings are visible in Basic mode. Click the  **Option** button the make the advanced settings available.

## Supplements

The device allows you to configure output data streams according to the needs of a skilled operator. You can reset the custom settings in the Project menu /  Option button by clicking the Erase – Load Default Configuration button.

### 3.2. Advanced Settings

#### Set the IP receiver parameters

Click to the  **Options** button on the Configuration Menu to set the following IP receiver settings:

**Source IP Address: Port Number:** the device lets you to set a filter to the source IP address and port number. Write the data into the input field (ex.: 10.123.13.105:1234).

**Destination IP Filter:** if the checkbox is selected, the device is instructed to receive the stream we set in the IP part of the **Destination IP Address: Port** input field. The default setting is checked.

**Destination Port Filter:** if the checkbox is selected, the device is instructed to receive the stream we set in the Port part of the **Destination IP Address: Port** input field. The default setting is checked.

**Source IP Filter:** if the checkbox is selected, the converter receive the incoming stream only if the sender device IP address (Source IP) matches with the IP address in the **Source IP Address: Port** input field. The default setting is unchecked.

**Source Port Filter:** if the checkbox is selected, the converter receive the incoming stream only if the sender device Port number (Source Port number) matches with the Port number in the **Source IP Address: Port** input field. The default setting is unchecked.

**Remove TEI=1 Packets:** if the checkbox is selected the converter remove the packets where the TEI flag value is 1.

**Remove Null Packets:** if the checkbox is selected, the converter remove the null packets from the stream.

**TS Analyzer Switched On:** the TS Analyzer is usually switched on. For more complicated tasks requiring higher processor capacity so the software can disable the analyzer. In the converter applications the significance of this option is not so important.

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## Supplements

Click the **Write the Report of Configuration** button to make an overall report in a pop-up window about the settings.



### 3.3 ASI Settings

#### General information

When a UDP packet is received the TS packets (such as  $7 \times 188 = 1316$  bytes) which are encapsulated in the UDP packet are forwarded to the RAM. Since the IP network does not transmit the clock signal, the user has to set the readout clock frequency of the RAM.

The best solution seems to be choosing the highest frequency (27 MHz) as this will never cause overflow. The disadvantage of this solution is that many devices (CAMs, decoders, etc.) cannot process this high clock frequency.

The device allows you to set a lower frequency (9 MHz), but in this case you can only use the ASI at lower data rates (up to 72 Mbps).

The data traffic on the ASI is illustrated by the following illustration when using the above two clock frequencies.

**Kép hiányzik!**


Click on the **Apply** button to load the settings into the device.

## 4. Main

### 4.1 Device Settings - Device data

#### Main Menu

The user interface software starts by presenting the Main page. The Main Page contains some important information about the device configuration and operation. The Main page is available even if the password-protection is switched on. The most important information can be read without the knowledge of the password, but you cannot navigate away from the Main page, the settings cannot be modified.

The graph on the Main tab shows the data-rate of the incoming streams. Click the  **Refresh** icon to read the current status.

## 5. Device

### 5.1 Management Port Settings

Entering the Device menu, you can configure the main features of the Management Port and the TS Port. The configuring of the device is available using the web interface through the Management Port. Management Port is capable to connect to the network in 10Base-T and 100Base-T mode, but the 10Base-T mode is no longer tested during production. The management port and the TS port is physically separated. In large systems, a separate network is built for the management ports and for the streams. In smaller systems, where only one network is built, the two ports can be connected to the same network.

## Management Port - IP Address

The default Management Port IP address is **192.168.10.10**, the network mask is 255.255.255.0.

When the device is installed the management port IP address has to fit into the network where the device will be used. So the first step is to set the management port's IP address. Static IP address and automatic IP address (DHCP) can be used.

In case of using static IP address: set a new IP address, hit the Enter key or exit from the input field until the window colour changes to white. Before you click on the **Apply** button check again that the IP address you set is correct.

The use of the dynamic host configuration protocol (DHCP) is only recommended to qualified experts.

The device settings (IP Address, Network Mask, etc.) are stored in the device. These parameters are completely independent of the parameters of the signal processing units (converter settings). The backup file or project file contains only the parameters of the signal processing tasks, it does not include the IP settings of the device.

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## Supplements

The device typically sends ARP messages to the network every 1 minute (this value can be modified by programming). Using Wireshark (or any other network packet analyzer software), you can read the IP address of the device from the message.

If it does not help then hit the [Reset] button on the back of the device, which resets the IP address to 192.168.10.10/24 (or 10.123.13.101/8) value. On this address, the software disables the password protection as well.


If you don't need to reach the device from a different network you can leave the default gateway input field empty. If the gateway mode is switched off the searcher module will not ask the network about the MAC address of the Gateway.

## 5.2 TS Port Settings

The device receives the TS from the IP network or sends the TS to the IP network via the TS Port. The TS Port supports 10Base-T, 100Base-T and 1000Base-T modes. When the SFP module is inserted in the optical socket, the unit automatically switches to 1000Base-X mode. The default TS Port's IP address is **10.123.13.102**. During the installation, the user is responsible for adapting the IP address of the TS Port to the application.

### TS Port - IP Address

When setting up the TS Port, make sure there is no IP address conflict on the network. The actual value of the IP Address is relevant in case of unicast reception.

Click on the **Apply** button to load the settings into the device. Click the  **Refresh** icon to read the current status.

The usage of the optical input:


The TS port can be connected via an optical module (SFP). The device detects when the connection is established through the optical fiber and switches over from copper to fiber automatically. If the connection is interrupted, the reset is also automatic. Wherever possible, strive for a more reliable optical connection. Unplug the SFP module in case of out of use because it unnecessarily increases the consumption. The power supply level is +3.3 V.

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## Supplements

The [Reset] button on the back of the device resets the IP address to 10.123.13.102/8 value.

### 5.3 Device Settings Options - Supplement to the device settings

The devices have a number of parameters, that rarely need to be changed, but there are some tasks that are impossible to perform without them. Click the  **Options** icon in the **Device** menu, new interface will appear to change the secondary parameters.

#### MAC Address Mode

The Ethernet network transmits the data packets to the different devices according to the MAC address, therefore, each device in the network must have a unique MAC address. CableWorld delivers the devices with the MAC Address beginning with B4 00 9C ... By choosing the Factory MAC mode, this value is assigned to the ports of the device and in most applications, it is adequate. In case of specific needs the **User Defined MAC**, and also the **CableWorld Auto MAC** developed from the IP address of the device can be used.


#### ARP Repetition Time

The ports of the device indicate their presence with an ARP message periodically on the network. The repetition time can be set 1 to 255 seconds. By setting the value of 0 the device disables the sending of the ARP messages. The frequent repetition of the ARP messages is unnecessary, the recommended value is 60 to 255 sec. The sending from the TS output port can be disabled. In the TS Input Ports the ARP messages are needed only in unicast reception. In the Management port it is not advisable to disable the sending.

#### IGMP Repetition Time

The inputs set for receiving the multicast stream, while receiving the streams, also are sending IGMP messages to the network, so as not to break receiving the streams. The repetition time can be set 1 to 255 seconds. By setting the value of 0 the device disables the sending of the IGMP messages. Too frequent repetition is unnecessary, the recommended value is a few minutes.

#### Apply

The secondary parameters of the two IP connections can be programmed separately. To validate the data click the Apply button. The data above the Apply button are programmed at the same time, they cannot be set separately. To read out the settings, click the  **Refresh** icon.

## Device Diagnostics

By clicking the Device Diagnostics button, the software reads the detailed product features and displays them on a separate page. These data may be useful primarily for the debugging processes.

## Password Settings

The interface can be protected by password from unauthorized actions. The password protected interface enables only the parameter query and the reading of the help.

To activate this protection, check the check box of **Use Password**. Type the same password in the boxes **New Password** and **Repeat New Password**. Click **Apply** to activate the new password.

To turn the protection off, uncheck the check box and click Apply.

## Software Upgrade

This product line provides to update the software of the user interface from outside. To start the update, click the button, and then on the display select the new firmware file with the **Browse** button. In our system the versions contain the full software, so you can go back by loading the earlier version.

Once you are satisfied that a good file is selected, load the file into the SDRAM of the device by clicking the **Software Upgrade** button. During this process you can see the loaded amount in % (percent form).

When the loading is correct, the flash memory will be erased and the new software will be written in. After the upgrade, the device automatically restarts. The process takes 10 to 20 seconds. Then, when the web browser is updated, you will see the new version.

## Device Reset

By clicking the Device Reset button, the microcontroller restarts the circuits, loads the program of the FPGA circuits again. This process simulates the power on process, but it is not completely equivalent.

## Factory Settings

To modify the factory settings the factory password have to be known.

## Develop Mode

The developer mode is available only if the factory password is known.

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## Supplement

The password protection is eliminated automatically by setting the Management Port to 192.168.10.10 or 10.123.13.101 (default). A device protected with unknown password can be set to the IP address of 10.123.13.101 by pressing the hardware **Reset** button (next to Management Port), and can be configured as desired.

If you run the file, the software will automatically turn off the password protection.

## 6. Backup

### *6.1 Load and Save Settings - Backup*

In the commonly used devices (e.g., converters, satellite receivers, switches) just a few features should be set. In these types the backup consists of writing a variant of the settings in the device memory or the computer memory. In these cases the file storing the configuration is called backup file.

In case of more complex devices the expectations are much larger. Here, in addition to the current settings, saving the database of the sources and saving the characteristics of the editing processes are necessary. This much wider range of backup allows, to carry out subsequent changes starting from the previous database. Since in this case, the majority of the database supports the editing processes, instead of backup file it is more correct to call it Project file and to talk about the saving of the Project.

Often one proven configuration must be programmed to several devices. You can do this simply by loading the Project file from your PC. Project file is also an important tool for remote assistance.

#### **Project menu**

In the Project menu above you can see the Project Description box, in which you should write an ID, which indicates the device application. The identifier and the password are saved together.

#### **Write and save Project (Backup) File into Device**

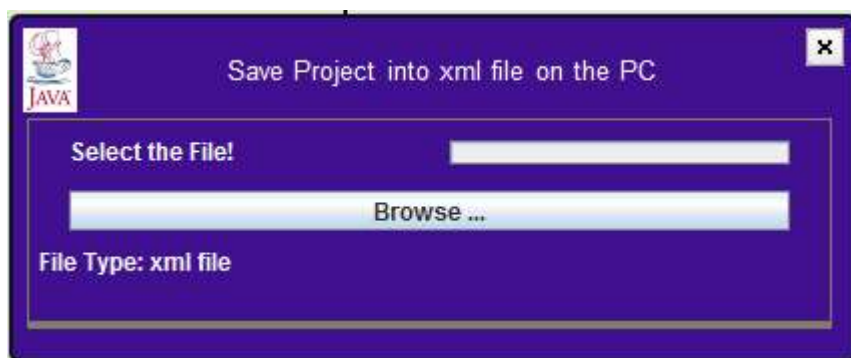
By clicking the **Save** button the software saves the entire project in the flash memory. The backup process is equivalent to the saving in the programming processes. When editing, if you want to save the state of editing without programming the device (e.g., the next day you want to continue editing), click the Save button.

#### **Load Project (Backup) File from Device**

By clicking the **Open** button the software reads the data stored in the flash memory and enter them in the boxes of the user interface. Then the operation of the device will not be changed yet, the user can freely dispose of the loading of programs (Tuner, CAM, Input-Output Module program). The software allows the partial use of the data.

#### **Write Project (Backup) File and save with JAVA**

Your web browser does not allow you to enter the Project file to your computer. By clicking the **Save as** button, the JAVA applet shown in the picture appears and allows the Project file to enter a directory of your computer. Browsers are getting stronger restrictions on the use of JAVA. So when JAVA is running and the JAVA applet cannot be used, close the open JAVA applet, then re-open it.



### Load Project (Backup) File from your PC


Project files saved on your computer is much easier to load, you do not need to have JAVA. To load from file is an excellent opportunity to configure several devices for the same task, or take over solutions from other applications.


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### Supplement

Running the software will not require your PC to install the JAVA, until the service built on it is used. When you want to run Java (e.g., clicking the Save as ... button), you should confirm it separately for the browser to run and accept the associated risks. The new versions of browsers do not continue to load JAVA, when you want to run the application, so achieve the proper operation by closing and re-opening.

The Project file is in xml format. The same file is saved in the flash memory and the PC. Some parts of the editing processes can be made in the xml file, but without software it is very difficult. When you are forced to do such task (e.g. remote assistance), run the software from file (without the device) and do the changes in the xml file with its assistance.

On the Project page under the  Options button, by clicking the **Erase – Load Default Configuration** button, it will erase your channel settings and restore features to the most frequently used values.

On the Project page under the  Options button, by clicking the View VLAN Main Setting button, the software allows users to modify VLAN settings.