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## 1. General description

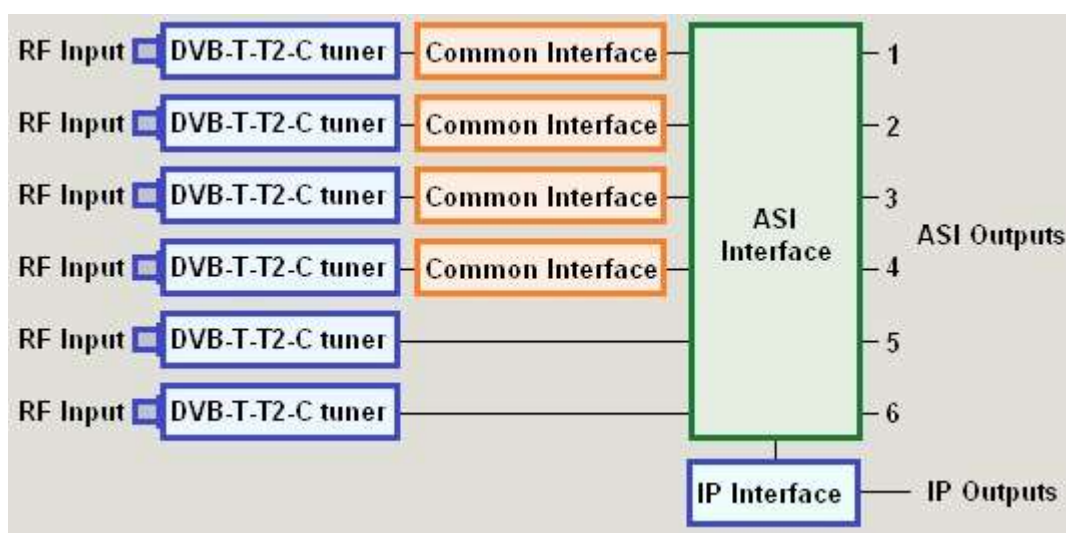
### 1.1. Device overview

#### DVB-T-T2-C Receiver family

CableWorld's latest receiver family is capable to receive both DVB-T, DVB-T2 and DVB-C signals. The full set of the device contains six tuners and four CI interfaces. CI interface can only be connected to the first four tuners, tuners 5 and 6 are always reserved for FTA reception.

The output signals of the tuners are connected directly to the ASI output or via the CI interface depends on the version. The ASI interface simultaneously delivers demodulated signals to the internal TS bus. The Gigabit Ethernet Controller II. connected to the bus, allows the TS to be analyzed and generate up to 64 IP output streams which can be SPTS or MPTS.

The device can be programmed via a web interface. The block diagram is illustrated in the following figure.



### 1.2. Software overview

#### Web-based user interface


The CW-46xx series devices have a universal web interface. When the user open the GUI the software automatically recognize the type of the device and load the proper configuration.

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 some malfunctions.

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

The software includes Java applet, but it will be called only 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 color 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 192.168.10.10 (or older device version 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 192.168.10.10 (or older device version 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. Transport Stream Analyzer

### General information


The devices are controlled by the Gigabit Ethernet Controller panel, which has Management Port and TS Port, as well. In many applications, this connector is only used for analyzing the TS, so above the connector the inscription is TS Analyzer. When connecting to any other of roles, the TS Input/Output Port label is used. Besides the traditional RJ45 connector, fiber optic cable via SFP module can also be connected to the TS Port.

The TS Port can manage 64 input and 64 output streams. Both the input side and the output side has a TS analyzer equipment. The device controller software determines the tasks of the TS Analyzers. The TS Analyzer continuously monitors the data rate of the streams and gathers informations from the PSI tables.

### Using the TS Analyzer

Open the View Stream Statistics module, then click  - Refresh icon, the instantaneous data rate of the stream and the number of packets in some main tables will be displayed. The figures show the rate at which the stream is present, and give information on the presence of some main tables (PAT, SDT, EIT, etc.).

Open the View PSI Report Analyzer module, those interested in details can get more information on the progress of the analyzing processes. In simpler tasks, this information is not required .

Clicking the  -Refresh icon in the table showing the programs of the stream, you can see the main characteristics of the programs. The table is read from the data of the PAT, PMT and SDT tables. The most important task of TS analyzer is to display these data. By clicking the right edge of the rectangles of the programs, a new interface opens and you can see the data of the components.

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### More details

The TS analyzer consists of two main parts. The data rate meter unit continuously monitors all the 64 streams in real-time mode. The PSI analyzer unit goes around the streams in time-sharing system and collects the sections of the tables. The data rate for all meter data are currently available, for the results of the PSI analyser sometimes you have to wait.

The incoming TS packets are counted by a counter formed from fast FPGA circuits. The built-in microcontroller reads and stores the counter status approx. per second. The software calculates the data rate from the number of packets and the size of the time gate. The measurement accuracy is limited by the poor resolution (e.g.  $188 \times 7 \times 8 = 10,528$  bps) resulting from the packet number.

The microcontroller first will attempt to compile the section of the PAT tables. The sections are classified as correct if the CRC checks okay. The time spent on the construction of the PAT section is 800 ms. The collectors of the PMT tables are set according to the PAT data.

The TS Analyzer has storage for collecting 90 different PMTs. From the PAT and PMT tables always only one section will be picked. The time available for the construction of the section is 800 ms.

The collection of the CAT table is the same as the PAT. In many applications, the operation the TS analyzer is speeded up by setting the collection time of the unused CAT to 100 ms.

The SDT Analyzer has storage space suitable for collecting 16 sections. For the construction of section 4000 ms waiting time is set. The NIT analyzer also has storage space suitable for collecting 16 sections. For the construction of section 10000 ms waiting time is set. In applications where the NIT is not used, the operation is speeded up by setting the construction time to 100 ms.

Based on the above the microcontroller cycles through all the streams and collects the sections. It indicates the successfully assembled sections and deals only with the incomplete sections in the following circles. If the stream is interrupted or the data rate decreases to zero, all the previous results of the analysis will be deleted. The sections collected will be reviewed after 300 s as the earliest, if the version number has changed.

The operation speed of the TS analyzer depends on the number of the input streams and on the contents of them. The software indicates the errors due to the failed section construction. In this case, wait a bit and ask to update the information at a later date. For a large number of streams the waiting time may be longer than 10 or 20 minutes, for a few streams this time is short. Where the software allows, store the good results, and perform other tasks in the waiting time. You can learn details about the process of analyzing the PSI by opening the View PSI Analyzer Report module.

TS Analyzer module of the software is able to analyze the sample stored in a file. The software examines just the first 20 MB piece of the sample. In applications where the TS is not available at the time of editing (e.g. night-on), use this opportunity. In case of samples stored in file, the software attempts to determine the time gate from the PCR data and uses this to calculate the data rate per PID. The built-in TS analyzer does not have a circuit for measuring the bit rate per PID.

## 2. Output settings menu

### 2.1. Output Settings

#### Output design

All versions of the receivers generate both ASI and IP output signals. The ASI outputs do not require configurations, at the IP outputs the output stream appears only after the configuration.

#### ASI interface design

The ASI interface has two, four or six BNC connectors. The BNC connector housing is grounded, the output is not floating.

The tuners produce 204 Byte/Packet output signal. In the versions with CI interface the CAM receives this signal directly, so in the tuner setting the CAM capabilities must also be considered.

The ASI interface receives the output signal of the tuner directly or via the CAM. The ASI interface removes the 16-byte Reed-Solomon error correction code and produces a 188 Byte/Packet format ASI signal. The IP output signals are produced from the streams transmitted by the ASI interface.

The ASI interface contains no separating transformers, high-voltage isolator, etc.. The output is made to ensure the connection between the devices. Take care that the output voltage must not be higher than a few volts, as it can cause punch-through of the output coupling capacitor dielectric, or damages the output stage.

### Setting up the IP output

To configure the IP outputs enter the **Output Settings** menu. As the first step in configuring the main output stream enter the values of the **IP Address** and the **Port Number**. 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.

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.

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.


Check checkbox **Enable** to enable sending the stream. This checkbox allows to turn on and off the output stream easily.

Check the box **Remove Null Packets** 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

Check checkbox **Remove Scrambled Packets** to remove the scrambled packets from the stream. The circuit decides on removal from the packet header. A similar feature can be found in the CAM module.

Check the checkbox **TSP Error** 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.

### Setting up other IP outputs

The hardware of the device allows to create additional streams from the previously configured IP output stream with using a multiplexer. Click  **Options** icon in the Output menu to see the **Advanced Settings** tab. On the resulting page you can configure three other output streams. In the device the multiplexer is located after the Filter-Remover unit, so only the output parameters should be configured in these three streams.

In applications where these additional output streams are not necessary, do not forget to stop sending the streams using the Enable checkbox.

## Supplement

The IP output performs unconditional streaming, i.e. it does not consider who receives the stream on the reception side. As the switch forwards the streams according to the MAC address, in unicast reception it is important to enter the value of the destination MAC Address correctly.

In the high-frequency demodulators the Reed-Solomon error correction circuit can indicate if it failed to correct all the errors in the packet. For the error message the Transport Error Indicator bit is reserved, following the sync byte. Note that in some tuners the operation of the flag can be turned off. When you use it, check if it is actually operated.

## 2.2. SPTS Settings

### Configure of the outputs from version 1.02

The first version of the IP output of the device was capable of receiving 6 tuner signals, and it could produce four output IP streams from each tuner signal with VLAN tagging.


From 1.02 GUI firmware version, PID Filter and PSI Inserter are also built into the device, so it is possible to produce SPTS streams. Beside the GUI firmware, the hardware firmware also needs to be upgraded to V1.11 or later. The new firmware of the hardware can be run with the previous GUI firmware as well, so the chapter 2.1 has been left unchanged.

The hardware with the new firmware (v1.11 or later) can filter 256 PIDs per channel. PSI Inserter can insert 16 TS packets. The packet timing can be set by specifying the time between packets.

In case of SPTS streaming, the device removes the video, audio, etc. PIDs from the MPTS, so output MPTS has a reduced content. MPTS is released with the original tables, so MPTS tables will not be modified.

### Output Settings - Basic Mode

In the Output Settings menu, the SPTS and MPTS mode can be set. The first 6 IP output permanently connected to the first six tuners and provide MPTS outputs. The remaining 58 IP outputs will automatically be assigned to user-specified programs (SPTSs). To create the tuner's MPTS output signal, click on one of the tuners on the left, in the first line of the analyzer, enter the IP Address and Port Number and set the enable switch to On. In Basic mode, the additional features of the output stream are set by the software to the most frequently used values (multicast MAC, 7 TS / UDP, VLAN tagging off).

For SPTS stream streaming, it is essential to analyze the TS, to know the elements of the stream in detail. To analyze the TS, click the  **Refresh** icon or load a TS from a file. After the analysis, set the destination IP and Port data in the entry box.

The software also shows that you have assigned an output stream for other programs that are not currently present, so before you load the settings, you should always check the complete list and disable the unnecessary SPTSs. If an SPTS is disabled, the given IP output can be used for other SPTSs (won't decrease the 58 IP output).

Click on the Apply button to load the new settings. If the settings are loaded all the previous programs will be overwritten. When more tuners settings have changed, the click on the Apply button is sufficient after the settings have been completed.

After loading the settings, the software saves it into the device. If the settings changed but has not saved to the device (you have not clicked on the Apply button) the original settings can be read out from the device by clicking the **Read Backup** - Undo button.

In the case of SPTS streaming, the device removes the elementary streams from the MPTS so the MPTS won't contain that elementary streams (MPTS become incomplete). In Basic mode, the software does not support to send incomplete MPTS. In Basic mode, MPTS and SPTS can not be used at the same time. In Advanced mode, this limitation is switched off so the incomplete MPTS can be sent to the output.

### **Output Settings - Advanced Mode**

Using Advanced Mode requires the operator to be skilled. To use Advanced Mode, click the **Advanced Mode** button. The Source selector window stay the same but appear the Transport Stream Analyzer window and the Smart MPTS - SPTS IP Stream Editor window changes to IP Output Stream window.

The drop-down list allows you to view or modify the 64 output one by one. As a first step, select one of the 64 outputs. Do not forget, the first six outputs are reserved for MPTS streaming. After selecting the given IP output the interface will show the details of the selected one. The radio buttons can set the following:

**Switched off** - the output is off.

**MPTS Mode Enabled** - output is configured to produce MPTS Stream.

**SPTS Mode Enabled** - output is configured for SPTS Stream generation. This mode is disabled at the first six outputs.

When you enable SPTS or MPTS mode, the first step is set up the IP settings. In Advanced mode, all settings (except the calculation of the multicast MAC address) has to be done by the user.

In SPTS mode, much more settings have to be done by the user than in MPTS mode. The software compiles PID Filter and PSI Inserter data from user-supplied data.

Once the settings have been completed, you can use the Apply button to save the new settings to the device. The **Apply** button loads all programs the 64 outputs just like in Basic mode.

### **Options - Advanced Mode**

**Go back to Basic Mode** – you can go back to Basic Mode by clicking the button or selecting the Output Settings menu.

**Modify Source Settings** – the null packets and the scrambled packets can be removed by selecting the given checkbox.

**Erase - Apply Default Settings** - in Advanced mode a lot of parameters can be set which are unavailable in Basic mode. Returning to Basic mode, these settings will be retained (eg 1 TS Packet / UDP instead of 7). By clicking the Erase button, all the settings will be set to default and Basic mode starts with the default settings.

**Switch On the SPTS Mode** - Enables the PID Filter and PSI Inserter.

**Switch Off the SPTS Mode** - disables the PID Filter and the PSI Inserter (we recommend using it for troubleshooting).



**View Output Report** – reads back the 64 IP Output settings from the device and shows the them.

**View PID Filter Programs** - reads back the PID filter from the device and shows the PID Filters program.

**View PSI Inserter x Program** - reads back the PSI Inserter program from the device and displays the tables of the selected output.

### **Modifications from GUI version 1.03**

In version 1.02, our users have experienced that the software repeatedly makes bugs in the development of SPTS programs, so in version 1.03 the following changes were made.

Many automata have been removed from the software and the database was converted to a fixed structure.

In the database, outputs 1 to 6 permanently used to generate MPTS output streams, outputs 7... 64 provide SPTS streams. From Output 7, the sequence of the SPTS output streams will be arranged by the sources (tuners) For example if we stream out 10 SPTS from tuner 1 and 12 SPTS from tuner 2 then from Output 7 to Output 16 will be connected to Tuner 1 and from Output 17 to Output 28 will be connected to Tuner 2. Whenever any changes are made, the entire output order is rearranged. The software stores only the data if the given output is enabled.

In Basic mode by clicking the button "Test and Save" the software saves the data into the device but does not apply them. An important difference to the previous version is that the Test and Save button must always be pressed before we go to the next tuner settings, otherwise the changes will lost.

By clicking the Apply button the settings will be processed, saved and loaded, so the Apply button will take much more time than Test and Save.

We recommend you when you edit the SPTSs use the Test and Save button and when you finished, click on the Apply button. In this way, you can decrease the configuration time and in case of a working device the live streams will be frozen for less time (every time when you press the Apply button, the software reprogram all the PID filters and PSI Inserters what causes freezing at the output streams during the programming time).

The recommended way to configuring the device is the following: executing the majority of edits in Basic mode, and if it is necessary to do other corrections (eg, erasing an elementary stream) then go to Advanced mode.

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### **Supplements**

Clicking to the Output Settings/Advanced Mode/View Output Report button the current settings can be seen on the bottom part of the displayed list. In case of 0x0000 value, the PID Filter and the PSI Inserter are off, while in case of 0x0300 value, they are switched on. When you are debugging always check first the configuration setting.

When generating SPTSs, the PID Filter pass-throughs the elementary streams (Video, Audio, and other streams), the PMT table and generates new PAT, SDT, and NIT tables.


Click the Read backup - Undo button or the Open button in the Project menu to read back the settings from the device.

## 3. Tuner and CAM settings menu

### 3.1. DVB-T/T2/C Tuner settings

#### Tuner Setup


The device is equipped with cutting-edge DVB-T/2/C tuners which provides several automatic modules in order to make their configuration extremely simple.

Choose the **Tuner** page and click the  Modify icon of the wanted tuner. Choose the desired mode (Auto, DVB-T, DVB-T2 or DVB-C), the bandwidth, and enter the frequency to be received.

**Mode:** in **Auto** mode the tuner automatically recognizes the modulation parameters of the input signal. Otherwise, it lets you choose the wanted standard and some other parameters manually. This way the locking process can be speed up.

**Bandwidth:** It is essential to choose the right value. Otherwise, the tuner won't be able to lock the wanted carrier.

**Frequency:** The center frequency of the carrier has to be entered in kHz. Although the range of tuner's AFC (Automatic Frequency Control) is more than  $\pm 500$  kHz, it is recommended to enter the right frequency value.

After setting the three mentioned parameters, click **Apply** and a few seconds later click the  **Refresh** icon to check the tuner status. You can find detailed information about this in the pop-up fields.

#### Tuner Status

The status of all the tuners can be checked on the **Status** page. Click the  **Refresh** icon to see the current status information.

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#### Supplements

The graphs on the Tuner page are for indicating the signal strength, the signal quality, and the carrier to noise ratio. The exact values are displayed in the text field.

It is recommended to choose the Parallel Fixed mode in the TS Clock Format drop-down field because it provides the CA modules with a jitter-free signal. Some CAMs don't work in Parallel Fixed mode. In this case choose the Parallel Variable mode.

## 3.2. CAM settings

### General information

In the DVB system the access to the services is limited by mixing the data in a secret process, in other words scrambling. The Common Interface (hereinafter CI) is the unit which is able to restore the data, i.e. remove the scrambling. The Common Interface is not directly involved in restoring the data, it's task is to provide the operation of the inserted Conditional Access Module (hereinafter referred to as CAM).

The CAM receives complete transport stream from the CI and gives back a partly descrambled transport stream. The CI tells the CAM, which streams should be descrambled, but the CAM overrides it in all cases. In case of successful co-operation all the required elementary streams will be descrambled. The CAM will not perform the descrambling if it is not authorized by the card inserted into it or the data read out from the stream, or if it is not able to implement this for technical reasons.

In the control of the operational processes, note that the performance of the CAM's microcontroller and circuits is very small, while the communication required by the standard is very complicated and difficult. The communication of the cheaper CAM modules is simplified, so some of the commands are not implemented (for example, they do not send feedback). You should use professional CAMs in professional systems.

### CAM Menu

Entering the CAM menu, select the action that you want to perform. The options are:

By clicking the **Settings** button you can configure the descrambling processes of the services.

The **CAM Analyzer** allows the qualified professionals to view the characteristics of the CAM.

The **Menu Handler** allows to study the menu system of CAM, but its use is recommended only for trained professionals.

Selecting the **Manual Mode** allows you to edit the Descrambler List without input signal.

### Settings

By clicking the Settings button, the user interface of the **TS Analyzer** and the **Descrambler List** will be displayed. The TS Analyzer shows the components of the TS, the components that you want to descrambler are collected in the Descrambler List. The empty place at the end of the Descrambler List indicates that the software is ready to receive the next component.

To fill in the Descrambler List, click any service in the TS Analyzer, and then click the Descrambler List to put them down. In this case, each component of the service is put on the list. Showing the components of the program (click on the right side of the service) allows you to transfer the elementary streams one by one.

The Cursor shape shows if you have added a component. The components can be discarded by the ESC key. When a new component is added, the previous one will be dropped. When inserting, the software sorts the components according to the PMT tables, and the selected components are always inserted in their own groups. The inserted component can be removed by double-clicking it. The double-inserted component will be automatically deleted. By clicking the **Erase Descrambler List** button the whole list will be deleted.

To start the descrambling process set the mode required for the CAM (see Supplement), and then click the **Start Descrambling** button. In compiling the list, note that the CAM capacity is finite (for example, it can descramble only 8 elementary streams), and do not enter elementary streams in the list unnecessarily.

## Refresh Crypt Information

By clicking the Start Descrambling button the software configures the CAM according to the settings. The CAM operation is slow, so sometimes it can take several seconds until one or another from the selected services appear in descrambled form at the output. In case of new cards or cards not used recently, up to a few tens of minutes waiting may be necessary, as the descrambling will not start, until the card authorization data arrive through the stream. By clicking the **Refresh Crypt Information** button you can get information on the state of the descrambling. The software displays the information in a new tab in detail. In the case if the data of the Descrambler List were not changed in the meantime, the green color on the right side of the descrambler list indicates that the descrambling process has been started. The red light means that the CAM program and the list do not match (in the meantime the user changed the list), so the software can not display the results in the list.

Depending on the type of the CAM module, the query responses for the status are expected as follows:

**No CAPMT Reply**

**Descrambling possible**

**Descrambling possible under conditions (purchase)**

**Descrambling possible under conditions (technical)**

**Descrambling not possible (no entitlement)**

**Descrambling not possible (technical)**

**No CAM Inserted**

**Initializing CAM**

**Query in process - PMT**

**PMT process error**

**PMT not found in the stream**

**Unknown**

After you start the decryption be patient, this process is rather slow for some module types. The No CAPM Reply message does not mean that the program can not be decoded. Some module types do not respond to this question or give a non-standard answer.

## Conditional Access Module - CAM Analyzer

The CAM operates in a closed environment, out of reach from the a user. However, during the operation of the systems - especially when detecting various errors - competent professional should see this internal environment, as well. To navigate in these internal systems the in-depth knowledge of the EN 50221:1997 standard is necessary, as well. When you select the **CAM Analyzer** function in the CAM menu, the software offers the following:

By clicking the **Reset CAM Module** button, he software send a Reset command to the module. The Reset instruction have the same effect as the reset in the Menu Handler, but in many modules it is not the same as

you unplug the module, i.e. disconnect the power supply. As a result of the reset, the module initialization and the loading of the last set parameters for decoding will be repeated.

When clicking **Refresh**, the software initiates a long process and queries the CAM parameters, internal states, messages, etc.. The report is displayed as text. The evaluation of the report requires serious expertise. The Summary Evaluation Report appears in the Result box.

### Menu Handler

Most of the CAM modules have menu system. The subscriber can be connected to the CAM via the menu system. The inscriptions appearing in the receiver are read out from the CAM menu system. The menus, subtitles, etc., available through the receiver, largely depend on how the receiver software has been designed, and how deep the CAM is able to support the environment developed in the receiver. The Menu Handler tries to show for the professionals what has been implemented inside the CAM.

By clicking **Enter Menu**, the software attempts to enter the CAM menu system. The green lights indicate that the software has received your request and attempted to implement it. The alternately flashing yellow lights indicate that you have entered the menu, be careful. You can not leave the intermediate part of the menu, you must close the menu properly before exiting. In case of an open menu, when entering other surfaces the software will not allow you to forget the open menu.

By clicking **Exit Menu**, the software properly exits the menu and allows you to continue to work in other areas.

By clicking **Go back**, the software prompts the CAM to step back one level.

By clicking **Root Menu**, the software prompts the CAM to move to the top level of the menu.

**Title text:** Text proposed to the receiver by the CAM to display at the top of the image.

**Subtitle text:** Text also sent by the CAM.

**Bottom text:** Text proposed by the CAM to the bottom of the screen.

In the CAM menu the CAM usually offers sub-menus, in which you can enter by clicking the **Select** button. In some types of CAMs you can move further. To step back use the Go back or the Root Menu buttons.

The common experience is that the menu systems of the CAMs are very different and in many cases do not work as expected. The examination of the CAM menu system requires serious attention and patience. Entering the menu the software continuously communicates with the CAM. Exiting the menu or the interruption of communication otherwise are indicated by the red lights.

### Manual editing of the Descrambler List

In the case if the stream to be decoded or a piece of it saved in a file is not available when configuring the device, the Descrambler List can be constructed manually. The interface needed for the editing appears by clicking **Manual Mode**. In this case the Service Id, PMT PID, ES PID, etc., data must be supplied by the user.

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### Supplement

In compiling the descrambling requests, note that a single elementary stream cannot be descrambled alone. For the CAM, information should always be provided on, which service contains the stream, accurately, which PMT table contains the information for descrambling the service. After these information the CAM can start

the descrambling only if it finds in the stream the CAT, EMM, ECM, etc., data streams and also the necessary descriptors.

When starting the descrambling process, the software sends so called CAPMT table or tables for the CAM, made from the data of the components. If sometimes in the CAM, the decoding of one or more elementary streams often stops, by resending the CAPMT the error may be eliminated. With the **CAPMT Update Enabled** module the CAPMT tables can be sent out over and over again. The repetition time can be set between 10 and 1280 sec. Use it to solve your problems.

By checking the box of **Reconfigure CA Module** before starting the descrambling process, the CA module receives reset command, the entire initialization process is executed. There are crashes, which can be solved only in this way.

By checking the box of **Auto Reset on CI Error**, the CAM gets a Reset instruction in about 6 seconds after the error detected in the communication.

By checking the box of **Auto Reset on PMT Version Change**, if the CI detects that the version number of the PMT table has been changed, it will send a reset instruction to the CAM, re-initialize, etc..

By checking the box of **Auto Reset on Decoding Error**, the CI is watching the video streams and if detects that the video stream is not descrambled, it will send a reset command to the CAM.

By checking the box of **Convert the Scrambled Packets to Nullpackets**, the CI converts all the packets with markers of scrambling in the header to null packets (PID= 8191). By this conversion the output data rate on the IPTV network can be reduced.

### CA Descriptor search process

The boxes on the right of the items in the stream list allow you to edit the details of the decoding process. Normally, the box displays the number of the stream to be decoded and the text **Auto**. When the Auto mode is selected, the CAM will search the CA descriptor for decrypting among the program level descriptors. By clicking the box, you can change this on the surface that appears, and even you can ask to read the descriptor from the level of elementary streams. The intelligent modules are able to select the appropriate descriptor independently, this time the PGM+ES Info (both) option may also be used. After you have changed the settings, click the Apply button to validate. This time the software performs the change for each stream of the group. When problems occur, feel free to change the settings! In many cases, only experimentation can figure out the well functioning setup of that application. Many problems can occur, when the stream is broken, when several different CA Descriptors can be found in the stream.

## 4. Status menu

### 4.1. Device Settings

#### Diagnostics Menu

The software producing the device user interface starts by presenting the Diagnostics page. The Diagnostics Page contains the key information about the device configuration and operation. The Diagnostics tab is also available for the password-protected devices. The most important information can be read without the knowledge of the password, but you can not go from here, the settings can not be modified.

In the middle of the Main page the photograph of the front panel and the back panel are shown. On the left side of the picture the name and the model number can be checked, whether you can see the user interface of the device you have chosen.


On the left side of the picture you can read the device temperature and the supply voltage of the +3.3 V power supply also. The IP input and output status information can be obtained by viewing the TS Port Link data.

The System up time shows the time elapsed since the last Power-up or the last Device Reset command. From the time scale the potential for power interruptions, or alien hand intervention can be inferred

The table of the operating characteristics are shown in the next section.

## 4.2. Operating parameters

The digital television devices are quite complicated equipment, a comprehensive overview of the operation is a long and complicated process sometimes even for the professionals. Entering the Status menu you can get quick information about the current status of the different units.

At startup the software fills the page with the most recent data. Later, the user can refresh the data by clicking  Refresh icon.

### Tuner state

The graph on the right shows Locked-Unlocked and tuner mode.

### CI

The CAM receives the output signal from the tuner. If the CI receives answers from the CAM module, a CAM module icon can be seen over the CI label.

### Data rate

The transport stream data rate has a very important role in the operating parameters. The data bit rate on the table is provided by the TS Analyzer built in the device.

### IP Outputs

The graph indicates the presence of ASI and IP streams.

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### Supplement

Entering the menu of the signal processing modules you can get detailed information on the settings and the operating characteristics. The settings of each module can be saved to a file or printed from the report prepared on request.

## 5. Device menu

### 5.1. DVB-T-T2-C receiver overview

#### Device configuration

The devices are always delivered with the same factory setting. The task of the installer is to integrate the device into the system. The main steps of configuring are to adapt the device ports to the IP network operating at the place of installation.

It is very important that the device settings (IP Address, Network Mask, etc.) are stored in the device, the setting of the signal processing units is fully independent from these device features. In the different types the Backup file or the Project file only stores the parameters that define the signal processing, the characteristics of the device are not included.

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#### Supplement

The third chapter of the joint help describes the programming of each component, but they must always be interpreted according to the variant. After reading the type number, the software displays only the user interface of the components built in the version.

### 5.2. Device Settings

On the rear panel of the receivers two RJ45 connectors can be found. To set the device connect your computer to the Management Port, start your Web browser and enter the IP address of the device in the box of the browser. The factory setting of the Management Port address is 192.168.10.10. To change the settings, enter the **Device** menu.

#### Device Management Port

The device can be programmed and controlled via separated Management Port. The Management port features should be tailored to the management network. The **IP Address** is the most important parameter. By clicking the **Apply** button the device will carry out the instruction, therefore, from this moment on, the device is only available on the new address.

Be careful when changing the IP Address, following the entry of the new value, press the Enter key, make sure that the data entry was correct. Click the Apply button only if you are absolutely sure of the accuracy of the data.

The values of the **Network Mask** and the **Gateway IP Address** are important only for special applications. The value of the Gateway IP Address should be deleted, and so the device is set to **no Gateway** mode. In no Gateway mode, the device does not keep asking the network the gateway's MAC Address value.


The **DHCP** mode is available in the device, but we recommend using it only for trained professionals.

#### TS Port

When setting the TS Port, be careful to avoid IP address conflicts in the network. The actual value of the IP Address is important only in case of unicast reception. Since there is no communication via this port, setting the **no Gateway** mode is practical.



## Apply

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

In case of changing the IP address, it is practical to enter the new IP address in the box under the connector.

## Use of the optical inputs

The port used for receiving and issuing high-speed transport streams, can also be connected via optical module (SFP). The device can detect when the connection is established through the optical fiber and automatically switches to this. If the connection is lost, the reconnection is automatic. Wherever possible, seek a more reliable optical link application. Do not store the SFP module in the device, when it is not in use, because it unnecessarily increases the consumption. Power supply: +3.3 V.


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## Supplement

The ports of the device send periodically repeated ARP messages to the network. In case of the Management Port the IP address of the device can be read out from these ARP messages, if you have forgotten.

In Chapter 1.3. it is described, how the device can be reset to the factory settings with the **Reset** button.

## 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 and TS Analyzer 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 (TS Analyzer Port, TS Input Port), 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 can not 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 Platform

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.

The device saves the password in a flash memory. Also this memory stores the text written in the Project Description text box of the Project menu. The identifier is optional, but may be useful if you want to see years later, how this device is configured.

### Software Upgrade Platform

This product line provides to update the software of the user interface from outside. To start the update, click the **Start** 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 **Load Upgrade File** button. During this process you can see the loaded amount in % (percent form). If you change your mind while uploading the file, you can cancel the process by pressing the **Cancel** button.

After successful upload click **Apply the new Firmware** to instruct the device to implement the change. 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.

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## Supplement

The password protection is eliminated automatically by setting the Management Port to 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 menu

### 6.1. Load and save settings

In the commonly used devices (e.g., 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

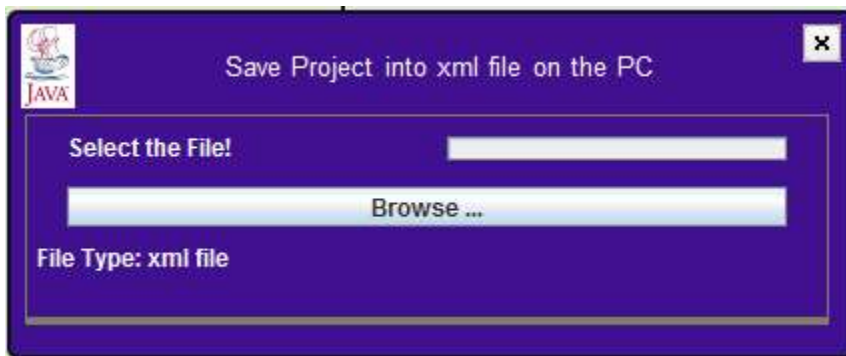
By clicking the **Save** button the software saves the entire project in the flash memory. The backup process is equivalent to the saving in the programming processes. When editing, if you want to save the state of editing without programming the device (e.g., the next day you want to continue editing),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



Using Java applets are restricted by browsers, so from 1.02 version of GUI, for save the settings we use HTML5 and the XML file is encoded by Base64 coding. The file extension changed from xml to B64. The previously saved settings can not be read by the new version.

### **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.