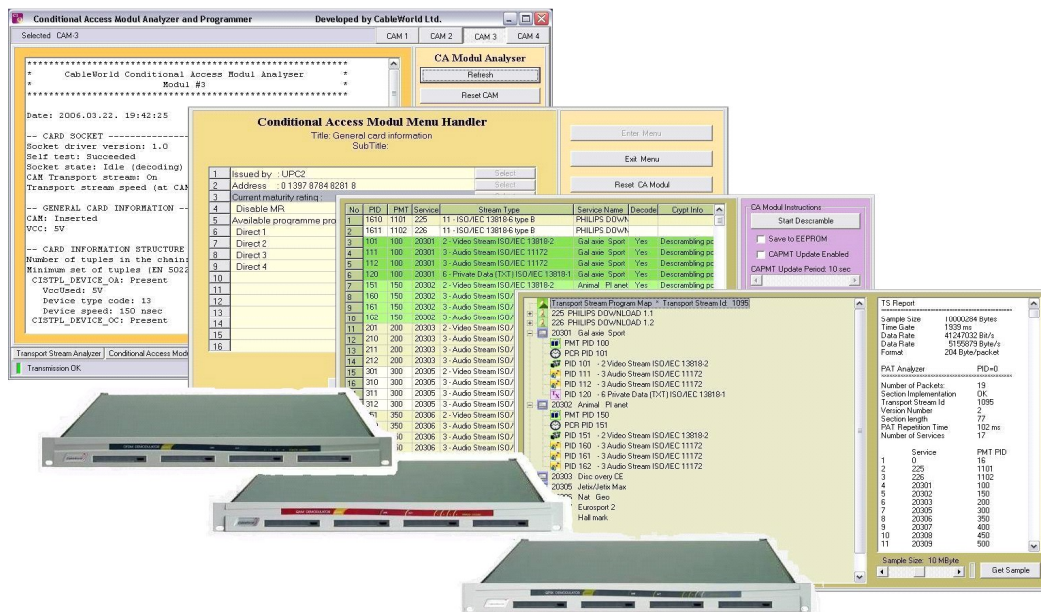# CableWorld ®

CW-4978 IP DESCRAMBLER QUAD
with Common Interface module

Digital television implies the important intrinsic feature of supporting access control by scrambling the services, thus it is very suitable for establishing pay TV systems. Descrambling can be done by a descrambler circuitry embedded in the receiver, or by diverse Conditional Access descrambler modules (CAM) connected to the receiver through a standardized Common Interface (CI). Supposedly as a further prevention of the scrambling codes from being broken, publications about the CAM modules are very rare and insufficient, and problems emerging at the operation of the CAM modules make permanent troubles to the system operators.

At developing the CI circuitry, CableWorld has broken with the way of using the dedicated integrated circuits applied worldwide, and has developed an own integrated circuit for implementing the Common Interface, that is, to perform the communication with the Conditional Access Modules. Making use of the CW-Net, this new system, beyond permitting to configure the descrambling system, displays on the user's computer screen the internal data of both the CAM module and the SmartCard, thus supports the disclosure of the mystic problems often emerging at descrambling.

In IP and ASI Descrambler each of the four independent channels is equipped with an own CI circuitry. Handling the CI interface and configuring the CAM modules is made with the SW-4872 CAM Analyzer and Programmer software, separately from the settings of the output streams parameters.

Main features of the Common Interface and its handler software:

- Common Interface handler IC developed by CableWorld
- Built-in Conditional Access Module Analyzer and Programmer software for testing the menu system, the hardware parameters and the operational state of the CAM and the SmartCard
- For professionals and designers detailed information can be retrieved from the communication layers of the CAM and the host processor
- The test results can be saved in file and placed on record in an easy way

The Common Interface standardized under EN50221 is a special application of the PCMCIA interface used with personal computers (PC). As known by experience, because of the complicated communication some types of set-top boxes and CAM modules are not able to work together faultlessly. A part of the operating problems originates from the fact that both processors, applied in the set-top box and the CAM module cannot co-operate with each other because of the complicated way of communication, and this is the reason for the frequent breakdowns of descrambling or even the total freezing of the module.

In order to understand what happens in the CAM module and why the individual types behave in a different way, the CAM should be imagined as a mini computer, which communicates with the set-top box through the CI. Since the set-top box is practically also a computer, in case of any error - depending on the structure of the operation systems – freezing may occur. In lack of a Reset button, the system can only be restarted by pulling the CAM and inserting it again in the CI connector.

The next problem is the CAM being in lack of any own user interface for its handler and of display. The system tries to use the TV screen as display, within the limitations by both the standards and the possibilities of the OSD of the set-top box, and in lack of user interface it expects instructions from the remote controller, and gets them (mediated also by the set-top box) in a right or wrong way.

Configuring the CAM is made with the built-in menu system. Note that the structure of the CAM's menu system, its elements, language and messages all are stored in the module; the set-top box, or in our case the PC through the demodulator cannot influence them.

The CAM analyzer function built in the SW-4872 software permits the user

- To inspect the menu system of the CAM and read out all facilities offered by the menu, independently of the behaviour of the set-top box (Menu Handler function),

- To inspect the internal information of the CAM, reading out the manufacturer of its software and hardware, version number etc., which are not available through the set-top boxes. Further, the software permits to measure the CAM's response times, inspect its momentary operational state, the validity and other parameters of the SmartCard, perform the in-depth analysis of the message exchange between the CAM and the host etc. (CAM Analyzer function).

Detailed analysis of the CAM's operation, and interpretation of the retrieved information need deep professional knowledge. However, comparing the main data and studying the operation of the different CAM types independently of the set-top box result in much useful information even for users not really skilled in the field, and may help them in solving the problems. The facility for taking records of the measured values and saving the results in file, facilitate the communication between manufacturer and user, thus speeds up troubleshooting.

The transport stream analyzer function built in the SW-4872 software displays all components of the transport stream and offers a user interface for appointing the streams to be descrambled. Due to the finite capacity of the CAMs' processors and other circuitries, the CAMs' descrambling capability (the number of elementary streams it can descramble simultaneously) is limited (and usually lower than the user's demand). The CI circuitry cannot increase the descrambling capability, but gives a possibility to the user for optimising the settings.

The scarcity of information available of the CAM modules requires the user to make experiments with the different solutions by descrambling the services at program level and elementary level etc. In the course of developing our devices we observed both the transport streams and the CAM modules being burdened with many errors. We found in the streams invalid CA descriptors having been forgot to be removed, misleading data, or data not complying with the standard, and in the CAM modules we found erratic menu items and menu items which cause the module to freeze etc. These errors make things difficult even for professional users, but we believe using this product will ease better understanding in this complex field.

Technical data

Number of connectors	2 (common TS input and device control, IP output)
Physical layer	1000Base-T / 100Base-T (Auto Negotiation)
Operating modes	unicast and multicast
Packet format	188 or 204 bytes/packet
Type of the data packets	UDP/IP
Number of packets	1 … 7 packets/UDP
Null packet removal	on / off switchable
Special feature	CW-Net format (128 … 1440 bytes/UDP)
Type of connector	RJ-45

IP Input/ Device control
Selection of the messages upon the Port Number (the Port of the device control must not fall into the Port number range of the transport streams)
4 separate programmable TS Receiver units
IP output signal
4 separate programmable TS Sender units
CI module

Number of the CI	4 independent CI modules
CAM handling	according to the EN50221/1997 standard, with multiple CA-PMT table handling matching the CAM
CAM supply voltage	+ 5 V / max. 3 W per module
Connection	68-pole PCMCI