**CableWorld**

**Gbps**
*The Highway.*

**DIGITAL TELEVISION SYSTEMS AND INFOCOMMUNICATION DEVICES**

# CW-4000

| CW-4941 | **ASI to IP Converter** |
|---------|-------------------------|
| CW-4944 | **IP to ASI Converter** |

## USER'S GUIDE

*Dear User!*

*CableWorld Ltd. regards digital television technology as one branch of the coming years' media technology, and which is going to merge more and more with computer technology and with technologies based on Internet Protocol (IP). The ASI to IP CONVERTERs and the IP to ASI CONVERTERs have been developed with this approach in mind; these devices are the connecting link between both fields.*

*Using the ASI to IP CONVERTER, the transport stream (TS) carrying radio and television programmes or other data, can be transposed from the widely used ASI environment in computer networks, in the first step in 100 BaseT or 1000 BaseT Ethernet network. After having been transposed in the computer network, the TS can easily be analyzed, stored etc. in the computer.*

*The IP to ASI CONVERTER performs this transposing in the opposite direction. It permits data streams generated in the computer or transmitted via communication network etc. to be converted into ASI data streams.*

*Using both devices in pair permits the transmission of the TS through computer networks and IP based communication networks.*

### 1. MECHANICAL CONSTRUCTION

Both the CW-4941 ASI to IP CONVERTER and the CW-4944 IP to ASI CONVERTER is built in standard 19" × 1 HU instrument frame. They are delivered along with following accessories:

1. Power cord                                    1 ea.
2. Spare fuse T 1.25 A
   (placed in the fuse holder mounting)          1 ea.
3. Crossover cable with RJ45 connectors          1 ea.

The power consumption of both types is very low therefore no cooling or ventilation is needed.

### 2. ELECTRICAL CONSTRUCTION

The input signal of the ASI to IP CONVERTER is a standard ASI transport stream. The device can receive ASI signals with both 188 and 204 Byte format. The ASI input is of loop-through type, at the ASI output a regenerated signal is delivered.

The IP to ASI CONVERTER generates 188 Byte format null packet series using a digital synthesizer, which can be programmed in 1 Hz steps in a very wide frequency range (from several Hz to several 10 MHz). When at its Ethernet input it receives transport stream (TS) implanted in UDP (User Datagram Protocol)/IP packets, it puts the packets carrying useful data in the place of the null packets. The device is equipped with two independent active ASI outputs, thus the output signal can be led to two further devices without any additional element.

The ASI to IP CONVERTER is configured by programming:

It can be made to send the TS to the computer, which has addressed it ("to Me"). In this mode, using CableWorld's software, the device can be operated also as a transport stream analyzer.

Further, the TS can be broadcasted, that can be used for signal distribution through the network for program distribution, or for educational or development purposes etc.

In the third mode, the TS can be sent to a given IP address. Here, the device sends out ARP (Address Resolution Protocol) messages to find the addressee, and only starts sending the TS after having received an answer from the given address. This mode permits the transport stream to be transmitted even through the most complex IP based networks. In multicast mode the UDP packets will be sent out unconditionally with the preset parameters.

Sending the transport stream can be switched on or off via the Ethernet network. The device can also be programmed to start operation always with sending the transport stream after having been switched to power.

Both devices can be programmed with the SW-4901 Gigabit Ethernet Controller software, which is free available for downloading from the www.cableworld.hu web site.

The devices and the computer are to be connected through the CW-Net network, whose physical layer is identical with those of 100 Mbit/s or 1000 Mbit/s Ethernet network, which is turned into CW-Net network by the data content of the transmitted standard UDP/IP packets and the instructions built in the packets.

The devices are equipped with own switching mode power supply. The supply voltage of the interface circuitry is 3.3 V, the signal processing circuitry works with a supply voltage of 1.2 V. Thus the power consumption is very low.

### 3. HARDWARE AND SOFTWARE SUPPORT

For processing (analyzing, remultiplexing, storing etc.) the transport stream, CableWorld Ltd. worked out an own system, which is unique worldwide. When getting acquainted with this system, our user will realize step by step that they received much more than expected. As an example, the user, who has a CW-4941 ASI to IP CONVERTER, has also a CW-4814 four-input TS ANALYZER. Who buys a TS Analyzer or a TS remultiplexer, gets also an ASI to IP CONVERTER, because this devices can be programmed to send TS to IP network. Our software provides this capability, and it permits a very wide application, just the user has to utilize it.

The new solution is based on the CW-Net, and beyond the device itself it needs a PC only. We presume, that in the near future each of our customers will have an own computer, which is suitable for controlling the CW-Net; but in case of demand we deliver the computer, too. The CW-4891 DataBoss is a computer built in 19" instrument frame, the CW-4892 DataChief is a portable notebook PC.

The ASI to IP CONVERTER and the IP to ASI CONVERTER can be configured with nearly any computer, which has 100 Mbit/s or 1000 Mbit/s network connection, after its IP address has been set to a fix value eg. to 10.123.13.201. For visualizing the TS some further small steps are required, that can be made by anyone who has some computer knowledge.

In order to familiarize the customers with CableWorld's unique system, and to dispread the system, we support our users with many technical guides and many pieces of software. The number of these descriptions and software is continuously increasing and will do that in the future, too. Our users have free access to them at our web site www.cableworld.hu. In the first phase of the system's introduction, following materials are available:

**CW_Net.pdf**
Summary of the procedure of building the CW-Net, and support for writing the first pieces of own software.

**CWnet_2.pdf**
Description of the use of the CW-Net, block diagram of the architecture of CableWorld's system.

**SW-4800 CW-Net Principal**
A simple piece of software designed for building the CW-Net, setting the IP addresses of the devices and testing the readiness for operation as well as for troubleshooting.

**SW-4890 Computer Performance Tester**
Simple software for testing the settings and the performance of the computer connected to the CW-Net network.

**SW-4811 B TS Analyzer**
Software for analysing the transport stream for getting known the structure and content of the TS, both for developing and education purposes and for testing and operating digital television equipment.

**Using_CW_Net.pdf**
Guide for using the CW-Net, support for the first steps, tricks for making own applications.

The CW-4941 and CW-4944 are the improved, gigabit versions of the former successful CW-484x series but with the significant differences as follows:

- Both types comprise four separate converters.
- The CW-4944 manages the multicast systems perfectly but has no PCR corrector.
- The transparent receiver function of the CW-4843 can be configured in the CW-4944 as well.

**CW-4901 Gigabit Ethernet Controller**
The set-up and control software for this module and the network is the gigabit version of the former CW-4841 software. Beside the basic settings it controls the four TS Senders and the four unicast/multicast TS receivers as well.

**Transport Stream Managing over IP**
This publication gives technical information for TS transmission over IP and detailed instructions for setting CW-4941 and CW-4944.

### 4. PUTTING THE DEVICES IN OPERATION

After unpacking connect the device to the specified mains voltage and switch on the power switch. Within a few seconds the device is ready to operation.

If the settings should be made using an own computer, download the SW-4901 Gigabit Ethernet Controller software from the www.cableworld.hu > Software page and install them by running their exe files. During the installation procedure the C:\Program Files\CableWorld library will be created automatically, the software installs here and create their icon on the desktop. All of our software has been designed for use under the Windows XP Professional operation system. The simpler pieces of software can be run also in other environment, where we have not tested them. More details please find in Using_CW_Net.pdf.

Set the IP address of the computer to the fix address 10.123.13.201 or to any other value within the 10.123.13.x range (x = 0 ... 255).

The CW-4891 DataBoss and the CW-4892 DataChief computers are delivered already with this setting.

All devices are delivered set to the IP address 10.123.13.101. It is strongly recommended to change the IP addresses of the devices to other values to avoid IP address conflict when using more than one device. Clicking the icon of the Gigabit Ethernet Controller then clicking the General Device Controller Platform button, the software for changing the IP address is ready for use. All necessary knowledge for using the software is to be found in its Help menu.

Connect both devices one by one to the computer via the crossover cable, and set their IP addresses to the desired values. In case of 1000 Base-T connection use straight cable and switch. In this example change the IP addresses from 101 to 102 and 103 respectively.

On connecting the crossover cable, the front panel „LINK" green LED will light indicating the presence of the physical connection established with the computer. If the link has been established at the requested 100 Mbit/s data rate, the yellow „ACT" (Active) LED will also light. The Gigabit connection is indicated by a separate LED in the rear panel.
On the computer's Ethernet socket the LEDs of identical function will act identically. The data traffic between device and computer is signalized with blinking of the yellow LED. Do not wonder if the yellow LED starts blinking just after the connection has been made, because the PC automatically contacts the device and starts a check-out procedure independently from the operator.
Configuring the sender and the receiver side is not difficult but needs understanding the characteristics of the unicast and multicast transmission. The configuring steps for the device and the network are shown in the publication 'Transport Stream Managing over IP'.
In the CW-4941 the four independent TS Sender modules of the Gigabit Ethernet Controller receive the signals from four ASI inputs. In the course of programming the operating mode of the four TS Senders should be set by the SW-4901 Gigabit Ethernet Controller software.
In the CW-4944 the four IP Receiver modules of the Gigabit Ethernet Controller supply the four ASI outputs. In the course of programming the operating mode of the four IP Receivers should be set by the SW-4901 Gigabit Ethernet Controller software.
**Important to know: The Gigabit Ethernet Controller operates in 'Forced Slave' mode the CW-4941 and the CW-4944 can be interconnected via switch only. Use straight cables for connecting.**

### 5. TECHNICAL DATA
The technical data of the CableWorld products are published in their data sheets, which are available at the web site www.cableworld.hu.

Additional technical data:
5.1. All ASI inputs and outputs are insulated by transformers, which assure 2000 V separation. This design is very advantageous in applications, where arising of earth currents due to transmission of the ASI signal between different rooms or laboratories have to be prevented.

The ASI inputs of our devices have metallic BNC connectors, which are directly fixed to the frame. On demand the BNC connector can be exchanged for an insulated version, the insulating transformer has already been built in.

5.2 Frequency accuracy of the IP to ASI CONVERTER

The device is equipped with a digital synthesizer, which can be programmed in a very wide frequency range. The NCO uses the frequency of the 125 MHz quartz oscillator of the device's Ethernet Board. The frequency accuracy of the generated output signal is better than $1 \times 10^{-4}$, its stability is identical with that of the built-in quartz.

The frequency coverage of the synthesizer has been limited between 1 Hz and 10 MHz by software, but the coverage itself is much more. During the tests the functionality was examined at realistic data rates only (100 kHz … 7 MHz; extreme low data rates (below 1 kHz) were not tested.

The detailed instruction set of the Gigabit Ethernet Controller is available in the 4901k_a.pdf file.

Not really skilled users can find more information in the user's guide of the former version (4841-a.pdf)

We appreciate receiving all remarks, experiences, measuring results made with our products and we pay respect to them at our further developments.

Beyond serial products, CableWorld is ready to deliver products for special demands and implement individual ideas.

For those customers, who integrate our products into their systems and undertake writing own software for operating the products or for solving their individual task, we assure extra technical support.