

4.2. IP Converter

The Transport Stream Remultiplexer builds the transport stream in UDP/IP packets, and sends these packets to the computer. The structure of these packets is described in the CW_Net_a.pdf file at www.cableworld.hu. The structure of the network and the configuration of the computer are described in the Using_CW-Net_a.pdf file.

The connection between the device and the computer in the simplest case can be established by connecting the RJ45 output socket of the device with the network card of the computer through a crossover cable. When using more than one device at the same time, it is practical to connect them through an Ethernet switch. However in this case straight cables must be used. Fundamentals of establishing networks are given in the CW-Net_a.pdf file, the details of putting the device into operation and configuring the computer are to be found in the Using_CW_Net_a.pdf file.

4.3 PID Filter module

The components of the input signal are handled by the PID Filter modules, which decide whether the particular elementary streams will be passed to the output or not. The status of the PID filter modules is set by the PIDfilt.dpf file, which is loaded in the device with the PID Filter and Editor software.

4.4 PSI Inserter module

For the right operation of the subscriber receivers (set-top boxes) information and control data have to be built into the assembled output signal. These data are referred to as Program Specific Information (PSI). The PSI Inserter module loads into the device the tables described in the PSIinfo.dat file

Assembling a new transport stream or modifying an existing one requires basic knowledge of digital television technology. This knowledge is also required for making the settings of the Transport Stream Remultiplexer. The detailed description of using the SW-4851 software is included in its Help file (SW-4851\Rem_Help\RemHelp.hlp), which after installing the software can be opened and printed even without running the software.

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.

From the point of view of electromagnetic radiations and protection against disturbances, it is advantageous if the outer shielding of the ASI connecting cable is earthed at a proper point. This point has to be found individually in each application.

If the user wants to earth the outer shielding of the coaxial cable just at the device's output or input, the product can optionally be delivered with metallic ASI socket(s) instead of insulated socket(s). In individual cases the user can easily make the earthing with a short jumper.

Troubleshooting for the most frequent problems at building the CW-Net, configuring the computer, putting the devices into operation and others are given in the Using_CW_Net_a.pdf file.

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 are going to integrate our products into their systems and undertake writing own software for operating these products or for solving their individual task, we assure extra technical support.

Note: The input selector control instruction of version 1.0 of the SW-4811 TS Analyzer software changes the NCO/Primary setting of the TS Remultiplexer. Therefore it is recommended to use version 1.01 of the SW-4811 TS Analyzer software for the remultiplexer. Until the TS Analyzer software is not used for setting the selector of the remultiplexer, version 1.0 is also suitable.



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CW-4000 DIGITAL CABLE TV HEADEND



CW-4852 CW-4854 CW-4858 TRANSPORT STREAM REMULTIPLEXER CW-4851 IP TV SERVER

USER'S GUIDE

Dear User!

Digital technology forms our environment day by day, and we can enjoy its advantages in more and more fields everyday. This are the years, when digital television technology takes over the leading role, thus it is time to get it know and make preparations to use it.

CableWorld Ltd. has made developing activity in the field of digital television for a couple of years. Its goal is to create a transparent, versatile and universal system, which makes this complex and complicated technology for both engineers and other technicians as manageable and lucid as analogue technology was.

In digital television technology, vision and sound signals along with all further data signals are carried by the transport stream (TS). The transport stream is nothing else as a vast data stream consisting of numerous elementary streams. For testing, measuring, modifying and remultiplexing the transport stream and transmitting it over different media, CableWorld created instead of separate devices, a matrix-like system consisting of software and hardware. Within the system, the pieces of software and hardware are built on each other; they support each other and even take over each other's function in certain cases. The connecting link between the pieces of software and hardware is the CW-Net.

The Transport Stream Remultiplexer serves for modifying the transport stream. It permits changing the parameters of the transport stream (e.g. data rate and format), changing its content (e.g. removing and adding elementary streams, replacing tables etc.) or assembling a fully new transport stream.

1. MECHANICAL CONSTRUCTION

The CW-4852, -54 and -58 Transport Stream Remultiplexers are 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 the CW-4852 is very low therefore it needs no cooling or ventilation.

The CW-4854 and CW-4858 consume very low too, but the 4 or 8 inputs need considerably more power. Therefore the free air circulation through the perforations in the rear of the unit must be assured. None of the devices contains a fan.

2. ELECTRICAL CONSTRUCTION

The CW-4852 Transport Stream Remultiplexer is equipped with two ASI inputs, the CW-4854 with four and the CW-4858 with eight ASI inputs. The general structure of the three versions is identical they only differ in the details connected with the number of inputs. The structure of the CW-4851 IP TV Server is identical with that of the CW-4852; the additional facilities are implemented by additional software.

The input selector and the Ethernet module of the Transport Stream Remultiplexer permit to put any of the input signals or the output signal in real-time mode into the computer, where they can be measured and analyzed. After getting acquainted with the content of the input signals, set in the computer the data streams, which have to be transmitted to the output. The file describing this setting is then to be loaded into the remultiplexer and it will operate the device accordingly. In the third step design the tables carrying the information to operate the subscribers' set-top boxes, and load into the device the file generating these tables. After having loaded both files, the Transport Stream Remultiplexer works without the further use of the computer, according to the performed settings, until it will be reprogrammed to another setting.

The devices are equipped with an own switching mode power supply. The supply voltage of the interface circuitries is 3.3 V; the signal processing circuitries are supplied with a voltage as low as +1.2 V. The power consumption of the devices is low; they are suitable for continuous service.

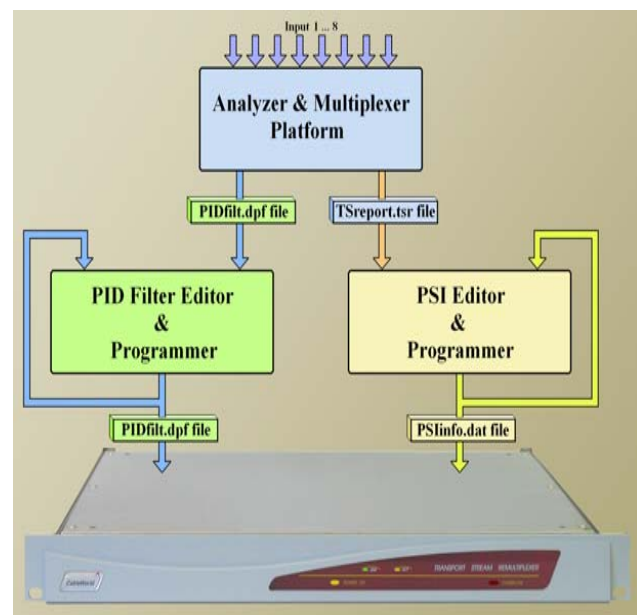


Figure 1

The linkage between the SW-4851 software and the device

Programming of the remultiplexers is made with the SW-4851 Transport Stream Remultiplexer Controller software, which is available for free downloading at www.cableworld.hu. The software consists of three modules:

- Analyzer and Multiplexer
- PID Filter Editor and Programmer
- PSI Editor and Programmer

All three pieces of software run simultaneously; it can freely be stepped in the computer from one program into the other. The loading sequence of both programming files is not determined either. The device can be reprogrammed at least 1.000.000 times. The linkage between the SW-4851 software and the remultiplexer device is shown in Figure 1. The detailed description of the software is to be found in its Help file.

The Transport Stream Remultiplexer builds the input or output signal to be analyzed into UDP/IP (User Datagram Protocol / Internet Protocol) packets and feeds them via the CW-Net in the computer. The physical layer of CW-Net is identical with that of the 100 Mbit/s Ethernet network, and it is turned into CW-Net network by the data content of the transmitted standard UDP/IP packets and the instructions built in the packets. For programming the Transport Stream Remultiplexer, first the computer needs to be made suitable for controlling the CW-Net system. Computers having been configured for controlling Transport Stream Analyzers are suitable also for the remultiplexers, without any change. The remultiplexers are capable to work as analyzer and also as ASI to IP Converter, since they can execute also the instructions of the SW-4811 and SW-4841 software. CableWorld Ltd. continuously enlarges the list of software offered to the CW-Net system.

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, the user will step by step realize to have obtained much more than expected. As an example, the user, who bought an ASI to IP Converter, has obtained also a CW-4811 one-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 networks. CableWorld's software provides this capability, which permits very wide application; just the user has to utilize it.

The new solution is based on the CW-Net, and beyond the device itself only a PC is needed. Presumably, in the near future each user will have an own computer, which is suitable for controlling the CW-Net; however 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.

For controlling the input selector of the Transport Stream Analyzer, or programming it to send TS, nearly any computer having 100 Mbit/s network connection can be used, after its IP address has been set to a fix value e.g. to 10.123.13.201. However, for visualizing and analyzing the TS a computer of much higher performance is needed, since here the transport stream itself has to be received and processed in real-time. The requirements for the speed of the computer are proportional with the data rate of the transport stream to be processed. Data streams of lower data speed can be processed with computers of lower capabilities.

In order to familiarize the customers with CableWorld's unique system, and to disspread the system, we support our users with many technical guides and numerous pieces of software. The number of these descriptions and software is continuously increasing and it 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_a.pdf

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

CWnet_2_a.pdf

Description of the use of the CW-Net, and 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 supporting troubleshooting.

SW-4841 ASI to IP & IP to ASI CONVERTER Controller

Installer software for both converter devices. This software permits using the whole IP address range, and provides also correction for IP addresses set mistakenly.

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 TS Analyzer

Software for analysing the transport stream in order to get known its structure and content, for both testing and operating digital television equipment and for developing and education purposes.

Using_CW_Net_a.pdf

Guide for using the CW-Net, support for the first steps, and hints for making own applications.

SW-4851 TS Remultiplexer Controller

Software for programming the TS Remultiplexers and the IP TV Server.

4. PUTTING THE DEVICES IN OPERATION

After unpacking remove the protection foil from the stainless steel cover of the device. 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-4800 CW-Net Principal, the SW-4811 Transport Stream Analyzer and the SW-4851 TS Remultiplexer 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, all pieces of software install here and create their icons 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, but here we have not tested them. The SW-4811 Transport Stream software is the most complicated among the pieces of software, its installation and use as well as setting the computer need much care. More details please find in the Using_CW_Net_a.pdf file.

The SW-4851 software does not need a media player installed, as given at the TS Analyzer, but as the SW-4811 TS Analyzer is very useful at checking up the operation of the remultiplexers, the installation of the media player is recommended.

Now, 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 in the system. Clicking the icon of the CW-Net Principal then clicking its Address 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 the device to the computer through crossover cable and set the IP address of the device to the desired value. In this example change the IP address from 101 to 102.

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.

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 session independently from the operator.

The Transport Stream Remultiplexer is built of four main parts, the Input selector, the PID Filter module, the PSI Inserter module and the IP converter.

4.1. Input selector

The CW-48xx series models are equipped with a board for an 8+1-element switch-row. In the different versions a part of the switch-row is not built up on the board, according to the sense.

The selector is built with IC switches, which can be programmed over the CW-Net; the total number of possible switchings is not limited. For increased versatility, setting of the selectors is not limited either by software or by hardware, that is, the “no input selected” state is also permitted. (This is the reason for the possibility of selecting e.g. input 6 at a four-input device whereas input 6 is not even built up here.)

There are applications where the selector should go to a certain position after the unit has been switched to power. This can be achieved by saving the setting of the selector in an EEPROM. Since for the EEPROM the total number of saves is limited to 100 000, for this operation a particular instruction is provided in the instruction set of the CW-Net. Saving the settings of the selector can be made most easily from the „Input Selector” platform of the SW-4811 software.

The inputs of the Transport Stream Remultiplexer receive ASI signals; the inputs are of loop-through type, thus inserting the Transport Stream Remultiplexer in the system does not need ASI distributors and does not engage ASI outputs either. The ASI loop-through outputs are of active type thus the input signal appears here after regeneration with full amplitude. All ASI inputs and outputs use insulated BNC sockets, which assure 2000 V separation between the shielding of the coaxial cable and the instrument frame.

The IP converter part of the device always converts (and sends to the computer) the signal selected with the selector, therefore at special applications of the Transport Stream Remultiplexer always take care of the selector's setting. During the use of the SW-4851 software, the input selector is always set from the Analyzer Platform. The input selector is set always in the selected position or in the position selected last. If you have doubt about the position of the selector, query or set it by the SW-4811 software.