

Transport Stream Remultiplexer Controller

SW-4952

Device controller software for the
Transport Stream Remultiplexers

Instruction manual

V1.04

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1. The structure and installation of the SW-4952 software

The SW-4952 IP Remultiplexer & Streamer Controller software has been designed for controlling the CW-4951 and the CW-4952 IP Remultiplexer & Streamer units but its programmer module allows programming the former CW-4851, -52, -54, -56, -58 type ASI-input remultiplexers as well. The Multicast Network Analyzer mode of the software allows using it for analysing and editing transport streams even without the device.

The CW-4951 and the CW-4952 are equipped with a Gigabit Ethernet Controller module and work in slave mode so they have to be connected to the PC via switch by CAT6 type straight cable. Each model of the CW-485x series is equipped with a 100 Mbit Ethernet Controller module and has to be connected to the PC directly by crossover cable or via switch by straight cable.

All products of CableWorld Ltd are of own development and constitute a uniform system. A number of descriptions can be found about using CW-Net and the Gigabit CW-Net system on the www.cableworld.hu web site. In the CableWorld system the software and the descriptions are available for free downloading and using.

The structure and installation of the SW-4952 software

Remultiplexing the transport stream is a complex task but simple steps can be taken with little skills, only special tasks need high-level expertise. In the SW-4952 software a number of automatic functions help and simplify performing the tasks. However there are manual setting possibilities in every procedure, so the job of skilled users is not limited. The SW-4952 software consists of four parts as follows:

- **Transport Stream Analyzer** – allows the deep learning of the input signals in order to get detailed information about the input data streams for creating a new stream. The summarized information taken from the input data streams are stored in the ‘Source Report’ (the set of TS Reports).
- **Transport Stream Constructor** – It is a desktop where the user can compose the desired output data stream with the support of the automatic functions.
- **Device Programmer** – It automatically delivers the programs to the output stream composed by the user, which will be loaded to device to generate the transport stream desired by the user.
- **Diagnostics** – This module allows monitoring the working parameters and the operation of the internal units of the device (in operation). The schematic diagram of the software is shown in Figure 1.1. Also this is shown on the (monitor) software control panel on starting the software.

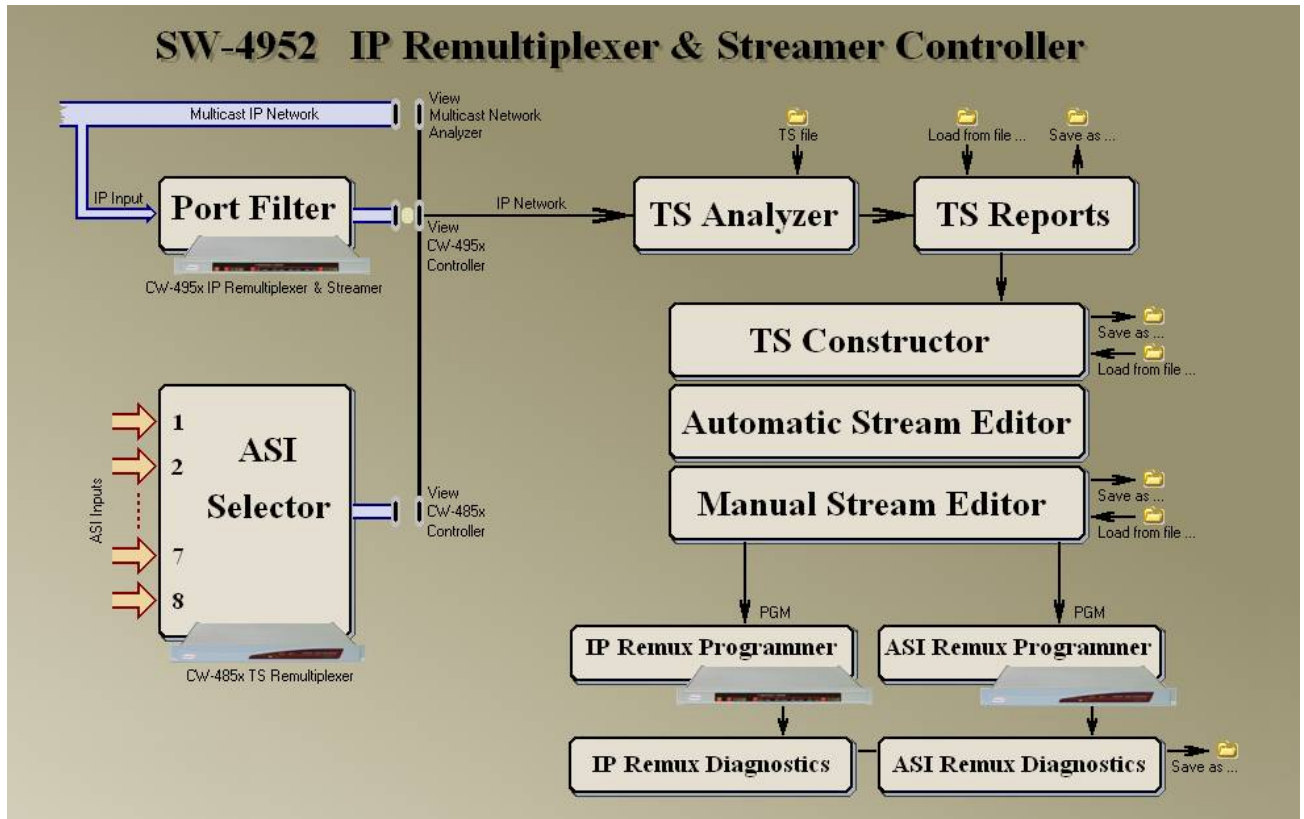


Figure 1.1
Structure of the SW-4952 software

The SW-4952 software installer can be downloaded from the www.cableworld.hu web site. On running the installer exe file the software installs in the C:\Program Files\CableWorld\SW_4952 directory. When operating more than one device or large systems the whole content of the SW_4952 software directory should be copied to subdirectories and should be started from there to avoid mixing the settings of the several systems. The user should put the starting icons for the SW_4952 copies on the desktop. These icons should be subtitled according to the system characteristics.

Designing the transport stream step by step

When using the SW-4952 software the transport stream design, the device programming happens by the following steps:

- Analysing the input transport streams, making the report comprising the transport streams (i.e. the Source Report).
- Making the frame of the transport stream with the desired number of services (programs) using the functions ‘New TS’ and ‘New Service’.
- Filling the empty TS frame with content; copying the services of the Source Report to the empty places of the output TS with mouse using the ‘Add to TS ...’ function.
- Making the tables required for operating the set-top box (PAT, PMT, SDT, NIT) and the programs to be loaded to the remultiplexer – by clicking the ‘Create PAT-PMT-SDT-NIT and the Device Programs’ buttons using always the automatic mode.
- Programming the device by loading the
 - IP Connection List, the
 - PID Filter Program and the
 - PSI Inserter Program.
- Programming the output streamer in the IP-output versions.
- Checking the device’s operation by using the Diagnostics module.

The use of the software; the steps of programming are shown in figure 1.2. In case of special demands (e.g. changing the name of the service, diminishing the components of the service, etc.) in the first step it is practical to use the automatic functions to do everything and in the second step to modify this starting material in manual mode.

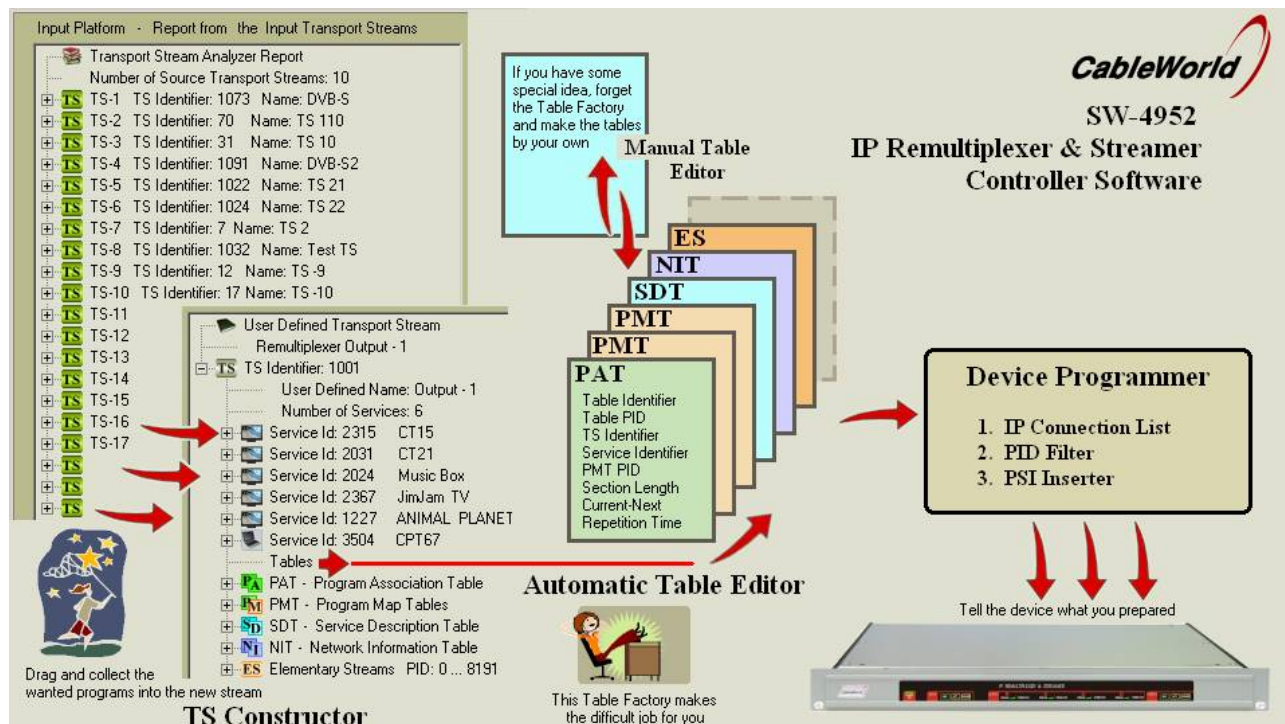


Figure 1.2 Transport stream design

2. IP Remultiplexer fundamentals

The main difference between the ASI-input and the IP-input TS remultiplexers is, that the ASI versions have visible, separate inputs but in the IP remultiplexer all input signals arrive at the device together via one RJ45 type connector so the input signals are not visible and cannot be separated. The transport streams from the IP network are forwarded to the connector of the assigned device according to the IP address. The Port number determines whether the TS passes through the connector or will be discarded.

The value of the Port number is optional between 0 and 65535 (h0000 to hFFFF). In the CableWorld's system design the first step is to determine the Port number range where the transport streams will be sent and the device control commands should be located outside this range. The suggested lower and upper limits for the TS Port range are 57000 and 59999 respectively. The communication ports of the devices should be located in the range 56000 to 56999. At default settings our system software automatically fulfil these conditions. The detailed description of these questions is available in our publication 'Transport Stream Managing over IP' (TSMoIP-m.pdf).

The IP remultiplexer can process the streams only within a (binary) range of 2048 ports in the reserved transport stream range ($57000+2048=60048$). At system design the user should pay attention to this terms.

In the case of the IP remultiplexer the lower limit of the Port range to be processed should be given by the Port Offset value and the port numbers of the transport streams to be processed should be set in the range between 'Port Offset' and 'Port Offset+2047'. The explanation of the Port Offset is shown in Figure 2.1.

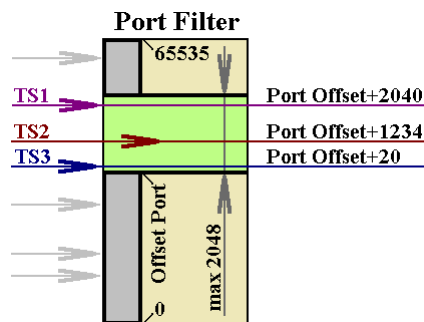


Figure 2.1

Structure of the Port Filter and explanation of the Offset Port

Supplementary information:

At the gigabit input of the IP Remultiplexer a few ns are available to decide if the incoming UDP/IP packet is allowed to transfer. The Port Filter compares 2048 (Port Offset to Port Offset+2047) Port values with the port number of the incoming UDP/IP packet and decides within 100 ns if the packet is allowed to pass through. The transferred packets get to the PID Filter input and the rest will be discarded. The four remultiplexers in the device use a common Port Filter. The four PID Filters should be set with a common Port Offset value. The momentary sum of the data streams transferred by the Port Filter is shown in the first diagram of the diagnostic module.

Important to know: The Port Filter can transfer the data streams, which effectively arrive at the input connector of the device. The data streams can reach the input connector only in unicast or multicast connection and incidentally in the unfrequented broadcast system.

At unicast connection the sender device should provide sending the data stream. The IP Remultiplexer automatically replies the ARP messages arriving incidentally.

For establishing the multicast connection the network used should be able to manage the IGMP (Internet Group Management Protocol) messages. In the second step in order to call in the data stream the IP Remultiplexer should send IGMP messages to the network, (but it should be configured first). The IP Remultiplexer sends IGMP messages to the network according to the content of the programmed IP Connection List, i.e. calls in the multicast data streams whose parameters are in the list.

The data streams sent out in the broadcast system will reach the input connector of the device automatically; there is nothing to do in this mode. The disadvantage of the broadcast is that loads the network to a great extent, so it is used rarely.

3. Using the transport stream analyzer

Start the software by clicking the icon on the desktop. The appearing graphic user interface (GUI) is set according to the content of the SW4952a.ini file. The settings of the GUI will be saved on closing the software if the user asks for saving. The ... Settings\SW4952a.ini file comprises all the settings required for running the software.

Supplementary information:

The settings besides the SW4952a.ini file can be saved with the '... \Save Settings as ...' command under optional name, and can be loaded in with the '... \Load Settings (*.ini) from ...' command at any time. The settings saved by the user differ from the content of the SW4952a.ini file, as they do not comprise the relations between device names and type numbers. Saving the settings in separate files and loading them is needed only in large systems at programming many devices or at beginners (e.g. the user wants to go back to the basic setting or needs remote support by sending the *.ini file).

One of the most important modules is the Input IP Address List, which comprises the 256 input IP addresses and port numbers. The device uses only the IP data streams listed there. This list can be saved irrespectively of the settings with the '... \Save Input IP Address List as ...' command and can be load with the '... \Load Input IP Address List (*.ini) from ...' command. Designing the Input IP Address List is a labour-intensive job. The data entry can be done by filling in the cells of the table or modifying the ini file with a text editor. Remember, the software receives the data of the table only on clicking the Enter button!

In the 'View' menu item select the type of device, which is to supply the transport stream for the analysis and the type of device to be programmed later.

Supplementary information:

The Transport Stream Analyzer module of the SW-4952 software can analyse the steams from the sources as follows:

- **Source: IP Network** The software can analyse the multicast data streams of the IP network even without a device and the unicast data streams arriving at the IP address of the PC. For analysing the network signals select the 'View Multicast Network Analyzer' setting.
- **Source: CW-485x TS Remultiplexer** The CW-485x series devices have ASI inputs. On selecting the 'View CW-485x TS Remultiplexer Controller' menu item, the device will send the ASI data streams of the inputs to be analysed to the PC via the IP network.
- **Source: CW-495x IP Remultiplexer and Streamer** The CW-495x series devices are equipped with a universal receiver module which can receive the multicast and unicast data streams of the IP network one by one and forward them to the PC. On checking the 'View CW-495x IP Remultiplexer and Streamer Controller' menu item the data streams to be analysed will be transmitted to the PC through the device. Select this menu item at installing the CW-4951 and CW-4952 IP Remultiplexer and Streamer.

The picture on the left shows the route of the streams according to the mode selected. Be careful, this setting will determine the other modes of the software.

Select the inputs you want to analyse. Be careful when selecting the IP inputs, analysing too many streams (more than 10) takes a long time.

Supplementary information:

The signal of IP input will be processed on clicking the IP address or the Port number in the Input IP Address List table. The line of the enabled address is marked green. Click the name to disable the input. The IP address enabled last time (marked yellow) will get to the list of the manual analyser.

The enabling and disabling of the ASI inputs can be set in the checkbox of the ASI input. Only the signals of the checked inputs will be processed. At the manual analyser the ASI input to be analysed is to be checked in the pull-down list.

The transport stream analyser of the SW-4952 software offers auto and manual mode. For analysing the input signals the auto mode should be used, the manual mode is useful only at troubleshooting and solving special tasks. The first step is to check in Auto – Fast mode if the analysis can run according to the user's conception. When the user can detect an incoming signal from every input, then they should select the Auto – Normal mode for analysing the input signals. The run-time of the Auto – Deep mode is very long, can take a few minutes, and so use it carefully.

Supplementary information:

In the Auto – Fast mode the analyser gets samples of 5 MByte and max. 1 sec long from the signal, so often occurs that some tables (e.g. NIT, BAT, etc.) are not found in the sample. In the Auto – Normal mode the size of the sample is 20 MByte and max. 5 sec, so the result of the analysis is usually suitable for remultiplexing. The Auto – Deep mode gets samples of 40 MByte and max. 20 sec, so the analysis takes long time.

The analyser software analyses the samples in the same way in all the three modes, the difference is caused by the content of the small and large samples.

It is important to know about the unicast and the a multicast reception, that

- in correct network operation only the unicast data stream sent to the device IP address will appear at the device connector.
- those multicast data streams will get to the device input, which are ordered there by the IGMP messages of the device.

The input stage of the CW-495x IP Remultiplexer does not monitor the IP and the MAC addresses; it is not its job. Its only job at unicast reception is to answer the incidental ARP messages, and so does it. At Multicast reception at the beginning of the reception it sends an IGMP Membership Report message towards the network, at the end of reception it sends an IGMP Leave Group message and besides these answers the IGMP Membership Query messages incoming from the network. The communication steps mentioned above and the correct network design together ensure that the data streams required can appear at the input connector of the device. The input stage of the device, the 'Port Filter' let the Ethernet packets pass by their Port number.

When filling the IP Address List at the multicast data streams, the Multicast IP address and the Port number are very important, enter them correctly. At the unicast data stream the unicast IP address is the IP address of the device, so any unicast address can be entered in the IP address cell, the software and the device will neglect it. It is very useful to enter the sender IP address in the cell as a reminder. The Port number is very important at the unicast reception, enter it correctly.

In case of unicast and multicast reception irrespectively of the device (CW-495x) and the software (SW-4952) the user or the operator should ensure that the data streams are sent continuously (streaming) by the sources in the required mode.

Analysing the signals of the sources result in line of reports about transport streams. This set of reports is called Source Report. The SW-4952 software can record signals of transport streams resulting from up to 256 sources in a common report. On the Source Analyzer page the user can briefly inspect this report, to see the main data (TS Identifier, tables, components, etc.), but there is nothing to do with it. The sample should be large enough to ensure that the properly deep mass of data is available from every transport stream to be used, and the tables and elementary streams to be used are there in the sample so that the software could enter them into the report.

At the end of the analysing process it is strongly suggested to save the Source Report in file (...Sources*.srp), to avoid the need for repeating this procedure. The design of the transport stream starts from this Source Report, the output streams and the device controller programs will be designed from this. On exit with saving the software saves the Source Report and on start this will be loaded in.

Supplementary information:

The SW-4952 software can analyse a transport stream stored in file, and *.srp format report can be made from this as well. The reports from several sources can be united and combined with the 'Add TS Report file to TS Report' command. These procedures can be necessary in the midst of a great task/work turns out that some analysis has not been done, was forgotten or some descriptors, tables, etc., should be inserted into the output stream what can be taken out only from samples saved in files. It is very important, that the active parts of the IP Address List in the joined reports suit to each other (IP address and Port number conflicts are not allowed).

4. Using the TS Constructor

The transport stream is a set of several data streams. The tree structure shows well the relation of the data streams. As the use of the tree structure for illustrating the components of the transport stream is widespread, so the SW-4852 software also offers this form for building a new stream. On entering the TS Constructor page the results of the analysis of the transport stream sources are shown on the left, and on the right the software waits for us to assemble the output stream on demand. In the Quad version use the 'View' menu item to select the output whose signal you want to compose, that is, which one of the four remultiplexers you are going to use.

TS Constructor Mode The TS Constructor offers three modes. In the 'Do not change TS' mode the software does not change the output stream, the 'Add to TS ...' mode is for building, the 'Remove from TS ...' mode is for disassembling the output stream. For assembling a new stream use the 'Add to TS ...' mode.

Create new TS In the first step create an empty transport stream (null packets) by clicking the 'New TS' button. First the software asks for typing the Transport Stream Identifier. This number between 0 and 65535 will identify the transport stream to be assembled. The second step is typing the name of the TS. This name will not be built in the stream but helps the user in identification later. When the user gives no data and clicks the OK button, the software will generate the missing data automatically. The software prepares one each empty PAT, PMT, SDT and NIT tables for the design. This time they are still empty and grey coloured.

The 'Create new TS' button is the clear button of the right side editor at the same time, as it clears every former design. The same effect can be realized in the 'Remove from TS' mode when the TS is assigned and dragged in the trash.

New Service The transport stream is a set of services (radio and television programs). On clicking the 'New Service' button the software always builds one more service in the transport stream. The software asks for typing the value of the Service Identifier (between 0 and 65535) and the Service Type. When the user gives no data, the software goes on with entering the default value.

In the second step insert as many services in the TS with the 'New Service' button as many programs you want to build in the TS. In this case clicking the OK button is also correct instead of typing the Service Identifier and the Service Type data.

New ... Table The transport stream controls the receivers with the inherent tables. When the user wants to build special tables in the transport stream, he/she can make place for these tables by clicking the 'New ... Table' button. The software asks for typing the table PID value and the Table Identifier. The 'New ... Table' function must be used only when solving special tasks.

New ES The transport stream is a set of elementary streams. When the user wants to take a data stream from one of the input transport streams that does not belong to any services, then he can make place for it by clicking the 'New ES' button. The software asks for typing the PID and the source (Port number or ASI input number). In the initial period of the TS design this operation is not necessary. In this operation the software cannot consider the rate of the stream. In the following step of the transport stream design the prepared empty places must be filled with content, real data. On the left side a number building blocks are available. In the 'Add to TS ...' mode clicking any element copies it to the clipboard. The main features of the element on the clipboard are shown in the 'Selected Item' box. On clicking any element on the left, the TS Constructor will not change the left side. The user can get rid of the marked element by clicking the trash.

Copying the complete TS Sometimes the user wants to transpose one whole input transport stream to the output, since only little modifications will be needed. For this operation click the selected stream on the left and then on the right insert the selected stream by clicking the header of the TS. On approving the content of the clipboard will be inserted except the TS Identifier and the TS Name. The copied transport stream can be modified later the same, as if it were assembled from its elements; e.g. services, elementary streams, etc. can be removed.

Copying services one by one Click the selected service on the left and then insert it in its place on the right. The software allows the inserting to empty places only; overwriting the former services is not possible. The PAT and PMT tables will be made automatically, in case of PID conflict the PID Remapper will work automatically. The software prefers and uses the Service Identifier given by the user, but it uses the source identifier if data are not found.

Copying the tables It is necessary when the user want to take a table from the source side for using it directly or with little modifications. Definitely avoid copying the PAT and the PMT tables because it totally confuses the stream. Copying the NIT tables often helps the design, copying the CAT, BAT, TDT, TOT tables will be an important design step in many cases.

Copying Elementary Stream The Elementary Stream inserted by copying differs from the stream inserted by the 'New ES' operation, because the software knows their data from the TS analysis, e.g. the data rate, so it can take account of them when building the stream. Use the copying when the Source Report comprises the data of the Elementary Stream, if not, use the 'New ES' operation, but be careful.

Remove from TS ... Almost any time any thing can be removed from the structured output stream. But be careful, because removing a few important data can confuse the stream and reversing the operation is not possible. After setting the mode, click the element to be removed, verify the operation if it suits your intention. The ‘remove Service’ and the ‘remove ES’ are the most frequently used operations. The design of the PAT and PMT tables is performed automatically.

Note: At removing the elementary streams the software is not monitoring if another service is using it. E.g. at removing the service, every elementary stream of it is removed, but this and the similar mistakes will be corrected later by the automatic functions.

Remapping function At inserting the elementary streams the automatic Remapping function is always switched on. At inserting the service the components are inserted by the automatic functions. For the new PID value always the next free PID value is selected. At inserting the elementary streams one by one the offered value can be changed.

Note: The PID values changed by the PID Remapper automata can be modified later in the manual editor. The ‘Full Remapping’ function clears these initial modifications (PID Remapping) and redesigns everything.

5. PSI Editor

In the course of programming the Transport Stream Constructor helps the user to describe for the software the transport stream he wants to create. The SW-4952 automatically processes the assembled transport stream (Output TS – 1...4); designs the tables required for controlling the set top box and makes the programs to be loaded into the device, when instructed. When the user wants to differ from the solutions of the automatic functions, he can change to the manual mode. We suggest for the professional users to use the automatic function first, and then to take over the control and accomplish the modifications on demand.

It is important to note, that the report of the transport stream (Constructed TS 1...4) assembled by the user can be saved into file and can be loaded as a start-up position any time. The software also takes the data from this report for design. The first step for making the tables and programs is clearing the content of the PSI Editor and setting the auto mode everywhere. This can be done by clicking the ‘Clear PSI Editor and set Full Auto Mode’ button. The design of the tables and the programs to be loaded to the device can be done by clicking by the ‘Create PAT – PMT – SDT – NIT and Device Programs’ button.

To sum it up: In the simplest case for designing the tables and the programs to be loaded to the device click the ‘**Clear PSI Editor and set Full Auto Mode**’ button and then the ‘**Create PAT – PMT – SDT – NIT and Device Programs**’ button. These two buttons can be found in the PAT – PMT Editor and the SDT – NIT ... Editor page as well. The buttons with the same inscription are completely equivalent; any of them can be clicked.

5.1. PAT – PMT Editor

Using the PAT – PMT Editor is necessary only when the user wants to modify the tables and programs made in the automatic mode.

Supplementary information:

The SW-4952 software uses the following databases:

- Source Report - The set of data describing the input transport streams
- Constructed TS-1...4 - The set of data describing the transport stream assembled by the user
- Table Report-1...4 - The set of tables and programs designed by the software
- Programs - The operating programs to be loaded to device

The relationships of the databases are shown in figure 5.1.

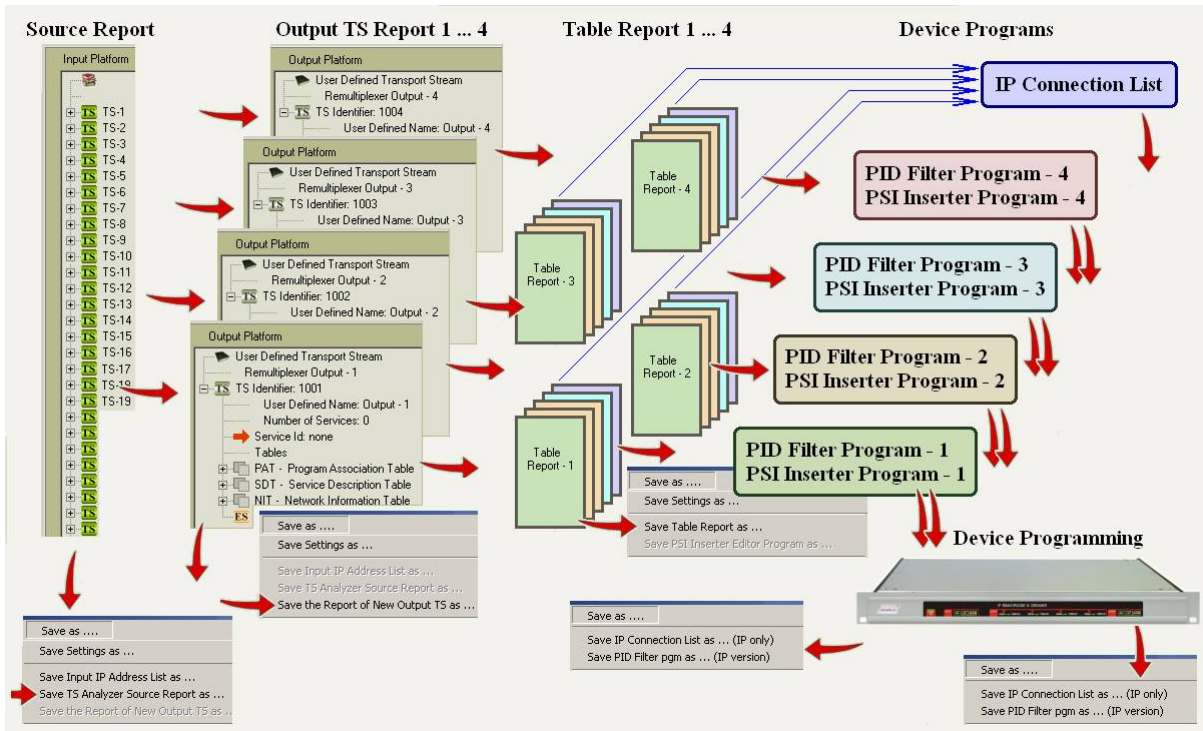


Figure 5.1
Databases of the SW-4952 software

The PSI Editor processes the database of the transport stream assembled by the user and writes the processed data in the Table Report database, then makes the device controller programs from this. The clicking of the 'Clear PSI Editor' button clears all the data of the Table Report and set the editors to automatic mode. The table and program design starts with processing the main data of the transport stream. The starting data can be seen in the Transport Stream Parameter Editor table. The initial values are loaded from the Settings.ini file. In order to change these data finally, modify the ini file.

A simple way for modification: Set the editor to manual mode and modify the wanted data in the table then click the 'Create PAT – PMT ...' button. In manual mode the software reads the data directly from the table then after the processing it writes back the data in the table to verify their interpretation. All units of the PSI Editor work in this way, i.e. the operation of the editors can be summarized as follows:

- The Editor works in automatic mode with the internal data and displays the result on the screen.
- In manual mode it processes the data on the screen so the user's modifications will get into the database.
- Clicking the 'Create PAT – PMT ...' button runs the complete editing process from the beginning in every case (except clear), and if it finds manual mode anywhere, it will do the editing with considering it.
- In the course of the editing after every modification, i.e. often and bravely, click the 'Create PAT – PMT ...' button in order to process and store your data.

In the course of editing (among the tables) the Program Association Table (PAT) will be edited first. At automatic editing the PAT Editor shows the series composed from the Service Id and the PMT PID values. Setting the PAT Editor to manual mode (User Defined PAT) the software assembles the PAT table from the (editing) table of the PAT Editor, so it can be edited freely.

The data will be read out on clicking the 'Create ...' button, and after processing the software writes them back to the table. During editing use often the 'Create ...' button, to ensure the interpretation and acceptance of your data.

The software writes a '0' value in place of the cleared data, the rows with 0,0 values will not get into the PAT table. The software makes a PMT table for those rows of the PAT Editor, where one of the two data is not zero. The current number of PMT tables belonging to the PAT table can be seen after the inscription 'Number of PMTs:'.

Attention! The automatic Service Identifier, the automatic PMT PID and the Full Remapping functions react to the PAT table. As a special service the PAT Editor permits passing PAT table from one input without alteration, or preventing PAT table from passing into the output stream. These two services are made for special applications and are considered at making the program of the output PSI Inserter.

The PMT Editor uses the PAT Editor data. In automatic mode the software makes all the PMT tables in one step, but cannot show them simultaneously. Clicking the rows of the PAT Editor one by one, always the PMT table belonging to the selected row will be displayed. In the PMT Editor always the displayed table becomes editable, and the others remain unvaried.

In the PMT Editor the user can switch on/off the automatic Service Identifier, the automatic PMT PID and the Full Remapping functions. In default setting the software works with automatic Service Identifier allocation and full PID Remapping function. The Full Remapping function overwrites the automatic PMT PID function.

The automatic editor produces the PMT tables with using the PAT – PMT Inserter. The descriptors of the PMT table can be seen in the Descriptor Editor when clicking the row of the Elementary Stream Information.

The PMT Editor also allows of the manual editing, when the 'Modify PMTs Manually' mode is selected. In this mode the Editor works only with the actually displayed PMT table, and leaves the others unvaried. In manual mode the PMT table will be redesigned with using the data of the PMT Editor table. Also at the PMT table the user can pass from the input stream in place of the PSI Inserter or prevent passing the PMT. Check this demand in the PAT Editor table (by clicking the PSI, Port, Off fields), but after checking remember to write it into the data with the 'Create PAT – PMT ...' button. In case of several PMTs click the 'Create PAT – PMT ...' button for each PMT separately. The data has been stored, if changing the PMT tables the setting does not disappear when displaying the table again.

At assembling the tables the most difficult task is the editing of the descriptors. The SW-4952 software provides an extra Descriptor Editor. In case of the PMT the descriptors get into the upper table of the editor by clicking the descriptors of the ES Info, where they can be seen separately. In the lower table of the editor the descriptor samples stored in the \RemuxDOC\Descriptors\Descript.ini file can be seen. The user can load the data of his own file to this store with the 'File\Load my Descriptor File (*.ini) from ...' command, but he can extend the content of the Descript.ini file, too. Remember to raise the number of the stored descriptors, too, when extending the ini file!

The selected descriptor of the descriptor storage can be inserted to the selected row of the editor by the 'Copy the selected Descriptor ...' button. The software copies back the whole content of the Descriptor Editor to the Elementary stream by the 'Copy Descriptors to ES ...' button. Any editing task can be solved with the two commands and the Copy-Paste (Ctrl+C, Ctrl+V) operations. The software always sets the length (cuts or completes) of the descriptor info to the 'Length' data. Remember, the modification of the PMT descriptors will be stored only by clicking the 'Create ...' button. During editing, do not skip among the software modules before clicking the 'Create ...' button, because some modifications can be lost.

Useful advice: When the user assembles one or more descriptors manually or copies from other sources, after the editing he should send them for checking to the Descriptor Editor, where the interpretation can be seen. It can be modified there, too, if necessary. As the second check put the descriptors from the Descriptor Editor to the table. Here the software recompiles the descriptors and corrects the remaining errors. The descriptors can be taken correct, if converting them several times to and from the same result is found.

5.2. SDT – NIT ... Editor

In the editor of the SDT, NIT, etc. tables always only the editor of the selected table is displayed by the 'View SDT Editor', 'View NIT Editor', etc. buttons. The first version of the SW-4952 software supports only the editing of the SDT and NIT tables and the Elementary Streams, the editors of the other tables will be built in during further development.

Before editing the SDT table the editing of the PAT and PMT tables must be accomplished. The software can automatically built in the SDT table those data, which can be found in the 'Constructed TS' set of data assembled by the user. Changing the names of the programs is possible in manual mode only.

The NIT table is independent from the PAT, PMT and SDT tables. It can be made any time. The NIT Editor can merely copy the input NIT table, and then it can be developed manually. The desired NIT table always must be created manually.

In the editor of the Elementary Streams always the state after editing the tables is displayed. The manual editing of the Elementary Streams is needed only when the user wants to realize a special solution (e.g. to build in a data stream from outside the PAT and PMT), or does not agree with the solution of the automatic function somewhere (e.g. to clear some audio data streams).

Supplementary information:

The SDT, NIT, etc. tables can be assembled manually as well, but we suggest doing it automatically first, and then modifying the data of the editor manually. Remember, the changes in manual mode will be processed only on clicking the 'Create ...' button. These tables also can be taken from the input as elementary streams, or the use of the table can be switched off. These selections also must be validated by clicking the 'Create ...' button.

In manual mode the SDT Editor permits of adding or removing services in the table. In manual mode all the data of the rows will be cleared from the table where the user clears the value of the Service Identifier. Giving the Service Identifier can open new row of data. The Descriptor Editor always shows the Descriptors of the selected row in the SDT Editor. See the use of the Descriptor Editor at the editing of the PMT table. The modified descriptors can be copied to the selected row of the SDT Editor with the 'Copy the Descriptors to the Table' button.

The software specially supports the editing of the Service Descriptor comprising the name of the service. The Service Descriptor marked h48 will be displayed in the SDT Editor table by characters as well. The appearing service names here can be modified directly from the PC keyboard. After modifying the name, on clicking the 'Insert selected Service Name to Descriptor' button, the descriptor of the selected name changes automatically. When modifying several names, click the button after every modification. Special characters can be inserted with the Descriptor Editor. Remember to modify the 'Length' field, when changing the length of the name. When modifying the name, for simpler editing insert temporary characters in the place of the special characters and then modify them in the Descriptor Editor. The copy and paste (Ctrl+C, Ctrl+V) can be used well in editing the SDT.

Suggestion: The work for modifying the name of the service and the service provider several times, can be simplified as follows: Write the frame of the Service Descriptor marked with the number h48 (72) with the company name and a few characters of the service name into the Descript.ini file and recall from there during editing. After the insertion only the name of the service is to be confirmed. As a muster, the descriptor frame of 'CableWorld' (as a service provider) is saved in the Descript.ini file. Who makes tables for several companies, can make his personal descriptor file from these descriptor frames. The self made descriptor file can be recalled with the 'File/Load my Descriptor File (*.ini) from ...' command.

The NIT table comprises the data of the distribution network (independent from the PAT, PMT and SDT tables), so it cannot be edited automatically. The automatic editor can display a NIT table only if the user put a NIT table in the Constructed TS previously. The NIT table can be edited manually or can be transferred from an input but its creation can be disabled. The large NIT tables are complicated, comprises many descriptors. The editing can be accelerated if the user can create his table by modifying a similar NIT. The NIT editing without starting data needs practice and expertise. The NIT Editor considers filling the Length field as a base and processes the characters according to these. Clearing the Length field will clear the related data as well.

The Elementary Stream Editor shows what Elementary Streams were transferred during editing. The content of the editor is largely similar to the content of the PID Filter Programmer. In the ES Editor the user can remove and insert streams in the same way as in the PID Filter Programmer. The special service of the ES Editor is permitting the transfer of all components from a selected port. E.g., this mode is required when a slow rate DVB-T transmission is to be extended with other programs.

On clicking the 'View Computed TS' button the user can see in detail the stream assembled as a result of the automatic and manual editing. On clicking the 'View Error List' button the user can see the errors found in the editing by the software.

5.3. Clear PSI Editor and set Full Auto Mode

On clicking the 'Clear PSI Editor' button the data of all tables and program editors will be cleared, the mode selectors change to automatic mode, the table editing and program designing process starts from the beginning.

Important note: After the clear the PSI Editor contains no data. On clicking the 'Create ...' button storing the data starts. On changing to manual mode more and more data will be stored. These data can be cleared safely only with the 'Clear PSI Editor' operation. During editing the tables, when the user modifies the assembled transport stream (e.g. removes and inserts a service), the PSI Editor must always be cleared, because the software cannot follow, where the former entries belong to, which data are permitted or not permitted to change.

6. Using the IP Remultiplexer (CW-495x) Programmer

The IP-input remultiplexer comprises four remultiplexers. The four remultiplexers can be programmed separately. The programming steps are as follows:

- Programming the input IP Connection Manager (with the common data of the four remultiplexers)
- Programming the PID Filter (the four remultiplexers separately)
- Programming the A PSI Inserter (the four remultiplexers separately)
- Programming the Special functions (generally needs no programming)

Supplementary information:

The IP Connection Manager calls for the multicast data streams from the IP network, so its correct programming is essential for the multicast reception. In unicast connection the device replies to the ARP messages automatically, the IP Connection Manager needs no data from the unicast connections. In other words: The data of the IP Connection Manager do not participate directly in creating the output TS. The program of the IP Connection Manager decides the IGMP messages the device should send to the multicast network, in order to make the network direct the required data streams here.

The PID Filter decides, which PIDs of data streams from which input transport streams and at which PID value will be transferred to the output data stream. Therefore the programming has to be made very carefully. The PID Filter modules can be reprogrammed separately. It is important to emphasize, that at the IP remultiplexer every input data stream (video, audio, tables, etc.) is identified with two values, the PID and the Port number together.

The PSI Inserter inserts the new tables in the transport stream. For the correct operation of the set-top box the content of the tables must be assembled carefully. The PSI Inserter modules also can be programmed separately.

The IP Remultiplexer & Streamer is able to provide a number of additional services (e.g. set top box software update). Programming these services is not necessary for the correct operation, but remember switching them off when they are not used.

Programming the IP Connection Manager

The 256-input IP Remultiplexer receives all the 256 input signals through the same RJ45 type connector. The transport streams required for the remultiplexing are called in by the IP Connection Manager from the IP network. For establishing the multicast connections the device sends IGMP messages to the network, and at the unicast connections it replies to the incidental ARP messages.

The IP Connection Manager handles only the connections, which are programmed in it according to the IP Connection List.

Important note: The four remultiplexers in the device use one common input, so the program to be loaded to the IP Connection Manager module must comprise the aggregated demands of the four remultiplexers. In line with the programming of the PID Filter modules, the IP Connection Manager module is to be reprogrammed as well, if the user has changed the input streams. The programming of the IP Connection Manager is fast, the number of permitted reprogramming is 1 000 000.

Supplementary information:

The IP Connection List comprises the list of the input IP streams to be processed. The software edits the list automatically, but the list can be edited manually too, it can be saved into file and can be loaded from file. The list will always be saved automatically in the 'IP_PGMIPconPGM\Connect.ini' file before loading in. The manual editing can be performed in the table of the screen and in the 'ini' file as well.

Editing in the table of the screen, the software accepts only the rows, where the columns of the IP address and the Port number are filled in. The IP address '0.0.0.0' and the Port number '0' cannot be used! The data can be listed according to any of the first three parameters. Click the 'Redraw' button to see the real content of the software memory, but remember clicking the 'Enter' key and then the 'Apply and Close' button if you entered data in Modify mode formerly!

The third column of the list decides, how the software handles the given IP address. In case of IGMP inscription, it takes it a multicast data stream irrespectively of the IP address value and sends an 'IGMP Membership Report' message to the network. At manual editing it is enough to enter an 'i' character in the cell. The ARP and the empty field are important only for the user. The device will reply to the ARP question effectively if the device's IP address is the same as the IP address here. At the unicast connections the right method is to enter the device's IP address in the IP Address field and next, the Port number of the unicast stream to be received, and to sign the unicast connection with an 'ARP' inscription. The empty field can be used to sign the IP address and Port data temporarily not used and allocated for later development and the multicast data, where sending the 'IGMP Membership Report' message is not required.

Note: The PID filter of the device uses the Port numbers only, and has no information about the IP addresses assigned to the Port numbers, so at reading back the program of the PID Filter, it is impossible to find out the relationship between the Port numbers and the IP addresses. The task of the IP Connection List is determining the multicast addresses where the 'IGMP Membership Report' message is to be sent, and storing the assignments of the Port numbers and the IP addresses. In the 'Comment' column of the table a 12-character long identifier can be assigned to the IP address and Port data, which will be stored in the device as well.

On clicking 'Query', the number of data stored in the device and within that the number of IP addresses signed for sending 'IGMP Membership Report' messages can be seen under the IP Connection List table. The IGMP Membership messages are sent out successively in every 10 ms, the frequency of the repeating is determined by the value of the IGMP Report Time.

Note: The four remultiplexers have a common input, so the program of the IP Connection Manager must comprise the aggregated demands of the four remultiplexers. Never call for a multicast stream unnecessarily, and do not set too frequent sending for the IGMP Membership Report messages. The repetition time of 60 s is usually suitable, but with the knowledge of the multicast network settings, the largest possible value should be set.

The software automatically edits the program of the IP Connection Manager by processing the data of the four remultiplexers. The manual editor on the 'SDT - NIT - ... Editor' page permits of making a short 'IP Connection List' from the program of the remultiplexers signed by the user. The command of the Special Functions menu item permits of adding new items from file to the existing IP Connection Manager program.

Special programming information: The 'ClearStreamTable' command clears the program of the IP Connection Manager, it takes a few ms. The programming uses the 'AddStream' commands. First always the data of the StreamType=1 multicast streams are to be programmed, the other data will be only stored but not processed by the remultiplexer. The programming must be closed with the 'StoreStreamTablePointers' command.

Programming the PID Filter

The software makes the program of the PID Filter automatically. In every case the PID Filter of the selected output (Output - 1 ... 4) will be programmed. As the first step of programming the software clears the 256 Mbit Flash memory in the device. On starting the Flash memory clears itself automatically; the clearing cannot be stopped. The clearing time is very different, typically 2 minutes, but it can take up to 5 minutes.

The software controls the course of clearing continually and indicates the end of the clearing. After the clearing the load of the PID Filter program starts. The software indicates the end of the programming.

Do not interrupt the course of programming! During a programming process programming of other modules cannot be started!

Supplementary information:

The device can handle 2048 port numbers and has 8192 PID Filter modules for each port. When the Flash memory operating the PID Filter is cleared, every PID Filter module is switched off. For switching on one PID Filter module, 6 bytes are to be programmed in the device. The first two bytes of the 6-byte data comprise the port number starting with the MSB byte. The second two bytes comprise the input PID value also starting with the MSB byte. The third two bytes give the value of the output PID (Remap PID), but here the MSB b5 bit has a special role. Setting the b5 bit to '0' is used for switching on the PID Filter module and enabling its operation.

Important note: The 2048 port values must be side by side. The name of the initial value is 'Offset Port', its value can be modified on the 'Special Settings' panel. The Query command always set the Offset Port to the value stored in the device. The suggested Offset Port value is 57000. The programming instruction of the PID Filter sets the value of the Offset Port, even if the user does not provide it. At the four remultiplexers the value of the Offset Port must be the same. If the user configures a few PID Filters then changes the Offset Port and configures the others, it causes improper operation. In this case only the latter filters will operate correctly. Reading back the PID Filter program can check the correctness of the setting. At changing the value of the Offset Port, the PID Filter modules programmed formerly, must be reprogrammed. The value of the Offset Port can be found in the 'ACK' reply and the read back data of the PID Filter program, as well. The software always saves automatically the program loaded to the PID filter in the 'IP_PGM\PIDf_PGM\PIDfilt1...4.dpi' file. The user can save the program under another name, and can load in programs saved formerly.

The structure of the *.dpi file: The first 256 bytes is the header, which is made automatically at saving, at loading the software accepts any kinds of headers. The header is followed by the 6-byte PID Filter data, but in the file the order of data differs from the order used at programming. The first two bytes comprise the value of the input PID starting with the LSB according to Windows, this is followed by the value of the output PID and the two bytes of the port, also starting with LSB. .

The SW-4952 software permits viewing and modifying the PID Filter program when necessary. In the table of the PID Filter Programmer the representation can be required in the order the input PID, the output PID or the Port number. For direct modification click the 'Modify' button. On clearing one data from any row the whole row will be cleared. For entering the new data 10 empty rows are available underneath. For data processing click the 'Apply and Close' button.

Important note: The automatic PID Filter editor is preferred to the manual editing. Always save into file the manually edited PID Filter program and call it back again just before loading. The manually edited programs in the software can be overwritten accidentally.

In the first step of programming the SW-4952 starts clearing the Flash and querying the state of the Flash in every second. During clearing click the 'Load PID Filter ...' button and then do not ask for loading, the device will stop clearing the Flash memory, but nothing will be written in any more. During writing the SW-4952 software signs the unused ports, in order to speed up the read back of the program. The read back time of the cleared but not written Flash memory is about 63 times longer than of the cleared and then written Flash.

Special programming information: The content of the PID Filter can be erased by the 'ErasePIDFilter' command. The value of the offset port is to be set with the 'SetOffsetPort' command always before programming the PID filter. The PID Filter is programmed with 'WritePIDFilter' commands. At the writing and reading (ReadPIDFilter) the absolute Port number is to be used, but only the relative port value is stored. When changing the Offset port value after the writing, not the written values will come back at reading! The input General Filter can be set with the 'SetGeneralFilter' command.

From the Port Filter unit of the IP input the packets get to the input of the four PID Filter units through a common General Filter unit. The General Filter allows prompt removing the null packets and the packets marked faulty by the Transport Error Indicator bit. In the course of programming we suggest switching on the removing of the null packets and transferring the packets marked faulty by the Transport Error Indicator. Who is fully aware of the effects of these operations can use any setting; the device is suitable for special functions, as well.

Programming the PSI Inserter

The PSI Inserter comprises 12 equivalent inserter modules. The SW-4952 software labels the first four Output Inserter modules as follows:

1. PAT-PMT Inserter
2. SDT Inserter
3. NIT Inserter
4. TDT-TOT Inserter

The Output Inserter modules can be programmed separately, their operation can be switched on/off, the loaded programs can be read back. The size and operation of the Output Inserter modules can be programmed comprehensively, but changing the configuration is required only in special applications.

Programming the PSI Inserter: The automatic editor sets the modes of the PSI Inserter too, on clicking the 'Create PAT – PMT – ...' button. There is nothing else to do, but loading the program by clicking the 'Load PSI Inserter ...' button.

Supplementary information:

Each of the four remultiplexers in the CW-495x IP Remultiplexer Quad types comprises 12 Output Inserter modules. The 12 Output Inserter modules get the user-programmed data from a common 32-Mbyte background storage. The storage is divided into 256 blocks of 128 kbytes each, the blocks can be cleared and a programmed separately. The 256-byte units of these blocks store the data of the packets to be sent. So one block can store the data of 512 packets; that is the Flash memory can store $512 \cdot 256 = 131072$ packets. The PSI Inserter module of the SW-4952 software assigns the 32- Mbyte background storage to the 12 Output Inserter modules in the partition as follows:

1. Output Inserter 1 PAT-PMT Inserter Counter	2 blocks (0, 1)	256 kbytes	Auto Continuity
2. Output Inserter 2 SDT-BAT Inserter Counter	2 blocks (2, 3)	256 kbytes	Auto Continuity
3. Output Inserter 3 NIT Inserter Counter	2 blocks (4, 5)	256 kbytes	Auto Continuity
4. Output Inserter 4 CAT-TDT-TOT Inserter Counter	2 blocks (6, 7)	256 kbytes	Auto Continuity

5. Output Inserter 5 Free	2 blocks	256 kbytes	
6. Output Inserter 6 Free	2 blocks	256 kbytes	
7. Output Inserter 7 Free (TS Generator)	12 blocks	1.5 Mbytes	
8. Output Inserter 8 Free (TS Generator)	16 blocks	2 Mbytes	
9. Output Inserter 9 Free (TS Generator)	24 blocks	3 Mbytes	
10. Output Inserter 10	Free (TS Generator)	32 blocks	4 Mbytes
11. Output Inserter 11	Free (TS Generator)	32 blocks	4 Mbytes
12. Output Inserter 12 Mbytes	Free (TS Generator)	128 blocks (128...255)	16

The partition is defined in the SW4952a.ini file. In general use the modification is not necessary, but when the user wants to modify the partition, he can do it in the SW4952a.ini file. Important note: On changing the partition generally the whole storage is to be reprogrammed. At designing the new partition it is practical to consider the block sizes and to assign the integral multiples of the block to the Inserter modules.

The 1.0 version of the SW-4952 software uses only a few percent of the possibilities offered by the 12 Output Inserters, the reserve is built in for supplying the demands of the following years. The structure and operation of the PSI Inserter, and the current partition of the background storage are shown in Figure 6.1.

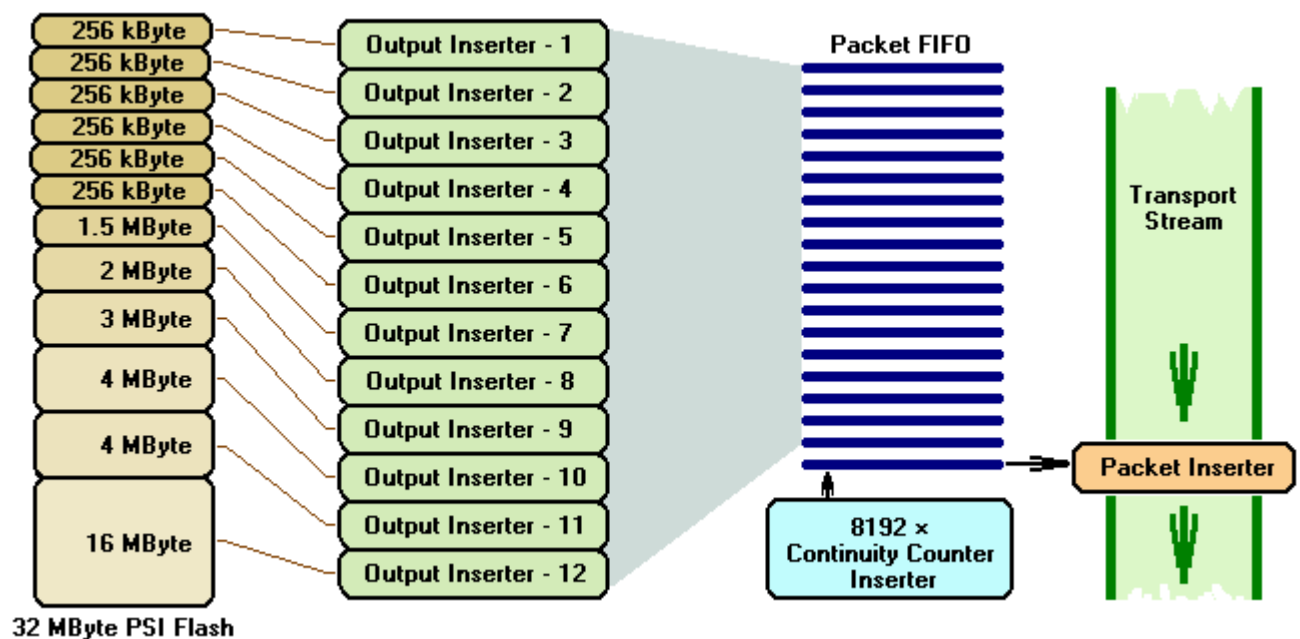


Figure 6.1

Structure of the PSI Inserter

At creating the tables the packets to be sent must be loaded in the 256-byte sections of the block. 3-byte timing data must be assigned to every packet. The packet delay before the insertion can be set to 0, 1, 2, ... 16777215 msec (279 sec) values. For the packets to be inserted an automatic Continuity Counter can be inserted for every PID value. The 12 Output Inserters use the 8192 Continuity Counter (CC) inserters jointly, that is the 12 Inserters put the packets to be sent in a common FIFO and the Continuity Counter Inserter processes the combined data stream.

At using the memory partition above, the PAT-PMT inserter can insert 1024 different packets, i.e. in case of maximal sized tables many hundreds of PMT tables can be created. The size of the SDT and the NIT Inserter is the same; they are suitable for creating practically any table series. The SW-4952 uses the automatic Continuity Counter insertion.

The programs of the 12 Output Inserter modules can be loaded and cleared separately. The programming and clearing can be performed during operation as well. The operation of every module can be switched on/off. Practical information: Switching on/off the operation of the Output Inserter modules permits switching on/off the prepared tables (e.g. PAT-PMT combination) with one command and performing other difficult tasks. Important note: The 12 Output Inserters have the same structure; any of them can be used for creating any tables. At the overflow of the the output stream, the order of inserting the packets does not change, and the overflow transitionally stops the delay clock of the inserting. The jam at inserting the packets is indicated by the diagnostics module and the front panel LED of the device as 'Overflow'.

The background storage of the PSI Inserter can be cleared at once, completely or by blocks. The full clear is performed by clicking the 'Erase PSI Editors ...' and is ordered for the storage of the four remultiplexers at the same time. The overall clear is practical at overall reprogramming and at erroneous operation caused by incorrect programming. (The background storage or some part of it must be cleared before programming; the software automatically performs it. The data of the flash memory cannot be modified.) The SW-4952 assigns the storage to the Output Inserters by blocks. At loading in the programs, the software clears only the blocks concerned, and so modifying the tables or the set-top box refreshing software will not change the operation of the other Output Inserter modules.

The Output Inserter modules can perform TS Generator functions as well, so the data of the set-top box refreshing software, data streams of pictures and movies, etc., can be programmed in the storage as well. The SW-4952 software use only the 1 ... 3 modules of the Output Inserter for creating the PAT, PMT, SDT and NIT tables, and switch off the others; they are available for the user. In the basic state the software shows only the controls of these three modules, the other modules can be recalled from the View menu. The software automatically creates the programs belonging to the tables, but the check boxes of the 'User Defined Pgm' allow at the 12 modules, for the user loading the program of his own. The program of the Output Inserter modules consists of 256-Byte packets. Before loading, the software saves the program to be loaded in 256-Byte and 188-byte formats as well. The 256-byte format will be saved in 'Oins105.doi' (Output Inserter-1/05. module) form, the name of the 188-byte format is the same, but its extension is 'ts'. The first 256 bytes of the 256-byte format is the header and then the packets can be found as shown in Figure 6.2.

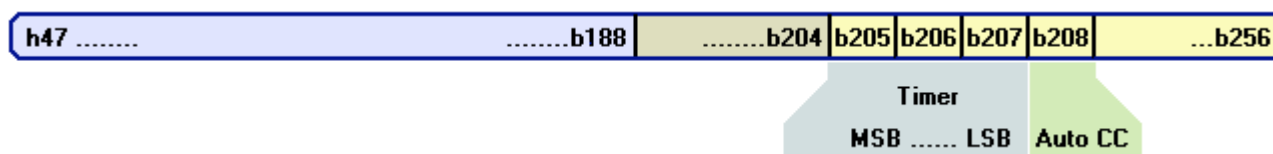


Figure 6.2

Structure of packet and timing data in the file with extension '*.doi' and the PSI Inserter Program editor

The content of the file corresponds with the data to be loaded, and can be loaded in any Output Inserter modules. The content of the file can be viewed with the SW-4811B Transport Stream Analyzer program after calling it in with the 'Load from file' operation. For viewing the data content the mode of the Data Analyzer is to be set to auto or 256 bytes/packet value. (In the 256-byte packet an optional comment can be placed from the b210 byte to the b252 byte. The last four bytes are reserved.) The 188-byte format file with extension 'ts', comprises no header and timing data, so it can be displayed with the software of other manufacturers. This format cannot be used for programming. At creating the files with extensions 'ts' and 'doi' the software insert 32 null packets at the end of the file, but this is not part of the program.

Programming the PSI Inserter:

1. First the software examines how many Output Inserter modules are to be reprogrammed and then sets their indicator to blue colour and asks for confirming the reprogramming. Here the user still can cancel the reprogramming.
2. On starting the programming the 12 modules will be programmed one by one. When the user does not asks for the reprogramming, the software will enable or disable the operation of the Inserter and sets the module indicator to green.
3. At reprogramming the software examines what programs are to be loaded. Generally it asks the program from the TS Constructor module. When the user asks for loading his program, the 'Open Dialog' box will be displayed, where a prepared (*.doi) file of PSI Inserter format is to be given. When the software does not get a suitable program for loading (e.g. Cancel, 0 sized file, inadequate file format, etc.), it loads a null packet to the 'Inserter' and switches off its operation (Switched Off). In case of small size, lack of the file and wrong file format, it sets the module indicator to yellow, and sets to red when the file is greater than the free space.
4. The software saves the program to be loaded into '*.doi' and '*.ts' files before loading.
5. The software clears the blocks to be reprogrammed according to the size of the program to be loaded.
6. The software writes the packets in the flash memory and displays the number of the packet at the same time.
7. After finishing the writing the software goes on disabling or enabling the operation of the Output Inserter module and saves the settings. .
8. The software passes on to programming the next module.

The PSI program loaded to device can be read back. At reading back the program of any Output Inserter module, first the partition of the Flash memory, the Flash Memory Sector Table (Start Address and Stop Address) will be read back. The read back data are displayed in the Diagnostics module, from where the data can be saved into text file. Then the program stored between the Start Address and Stop Address will be read back. The software automatically saves the read back program in the '... IP_PGM\PSI_PGM-qRbackPGM' directory and loads it to the PSI Inserter Program Editor on the Data Rate page.

Using the PSI Inserter Program Editor for CW-495x:

Generally the PSI Inserter Program Editor module is not used, but it helps solving special tasks and speeds up troubleshooting. Because of its secondary role it is placed in the free space of the Data Rate page. The PSI Inserter Program Editor is a table, which allows creating, viewing and modifying the PSI Inserter program. The PSI Inserter Editor can be loaded up from external source with the 'Load PSI Inserter program to Editor menu' command. At the PSI Inserter programs saved under name '*.doi', the header and the additional 32 null packets will be cut off and only the effective data part can be seen. At loading traditional 188-byte transport stream, every packet will be loaded.

The loaded program can be edited freely. In the 256-byte rows the timing and control data are shown as in Figure 6.2. After the modifications the data processing starts on clicking the 'Compile' button. At the end of the program the Compiler clears the whole row. If the user clears the initial h47, then the erroneous data will be replaced with hFF.

The created or modified program can be saved with the 'Save PSI Inserter Editor program as ...' command. The saving is done in the two formats mentioned above.

The SW-4952 software saves the read back PSI Inserter program into file and loads to the Editor simultaneously, so it can be viewed simply.

The PSI Inserter Program Editor can be used well to programs comprising up to a few hundred packets, but the operation slows down with increasing the number of packets. It can be used with many thousands of packets, but at such times filling in the tables or processing the data takes a few seconds. Wait until the process will be completed! For creating very large sized (many Mbytes) programs it is practical using another software.

Programming the output streamer

The CW-4951 IP Remultiplexer and Streamer delivers the four created transport streams at physically and logically separated IP outputs. The factory setting for the device's input IP address is 10.123.13.101, for the output IP address is 10.123.13.102. These two IP addresses must not be the same in a common network!

The IP address of the input and output module can be modified with the SW-4901 Gigabit Ethernet Controller software. After installing the software can be started from the SW-4952 software with the 'Streamer Programmer' command.

The programming of the output streamer is fully independent from the programming of the IP remultiplexer, so it can be done any time. The procedure of programming is described in the help of the SW-4901 software. This help is available for downloading in pdf format too, on our www.cableworld.eu web site.

Special Settings / Functions

The user need not care for the special settings, the software and the default settings of the devices result in correct operation.

Supplementary information:

Apply TS Port Offset

As mentioned in Chapter 2, the IP remultiplexer compares the Port number of the incoming UDP/IP packets with 2048 values instead of the 65536 values. So the streams can be passed through, when the Port number is within this 2048 range. The lower limit of the range is the Port Offset value. The Query message reads out the Port Offset value and displays it on the screen. The default value of the Port Offset is 57000 equally in the device and in the Settings.ini file.

If you want to change the Port Offset value, type a new value in the box. On clicking the 'Apply new TS Port Offset' button, the software reprograms the device and the value read from the device's reply appears in the box. In case of successful reprogramming both the device and the software will work with the new value. Changing, setting the Port Offset value is suggested always just before programming the PID Filter. At changing the Port Offset all the four PID Filters must be reprogrammed.

Remove Input Null Packets

The null packets arriving at the input are usually not necessary; it is practical to discard them immediately. At the default settings of the device and the SW-4952 software the input null packet removing is always switched on. With checked check box this function of the Input Filter input is switched on. The Query command sets state of the Check box according to state of the device. The device setting can be modified with the 'Set Input Filter' button. By removing the input null packets, the load of the circuitry and the SD RAM decreases.

Use Transport Error Indicator

On the high frequency transfer routes the Reed-Solomon error correcting circuitry provides for correcting the errors. When all of the errors in the packet cannot be corrected, the corrector sets the Transport Error bit to '1'. By checking the 'Use Transport error Indicator' check box the user can ask for prompt discarding the packets marked faulty. As discarding the whole packet causes greater failure in the video and audio streams than the real error inside, so discarding the faulty packets is not suggested. In general, do not check this box, do not use removing, but remember that this function may be useful in special applications.

The grey field by the button indicates an unknown value determined by the software, the green field indicates a value read back from the device. The red field indicates an unsuccessful setting.

Reading back the loaded programs

Reading back the loaded programs is required only in special applications; this function is not required for installing the device.

Reading back the program of the IP Connection Manager

For reading back the IP Connection Program select the 'Read back Program from Device' menu item and then the 'Read back IP Connection List' command. The reading back process is fast the read back list can be seen in the editor. Save the read back list into file, if you want to use it another time besides viewing.

Reading back the PID Filter program

Important note: The reading back process of the PID Filter Flash memory is very slow, if it was not programmed after clear. This is the situation when the user erases every data with the 'Erase PID Filter 1 ... 4' button. In this state, reading back the data of the 8192 PID filters of each port number takes 2-3 seconds. The total reading back time is $2048 \times 2 \dots 3$ sec, i.e. more than one hour. In this case stop the reading back with the 'Stop Read back ...' command.

The reading back of the PID Filter program is much more faster, if it is done from the programmed PID Filter. At programming the Flash the PID Filter Programmer sets a marking code at the PID=0 value of the sub-store of the Port number, if no PID filters are used in that store. When the software finds such a code, it omits reading the sub-store. In this case at reading back, the port numbers run quickly on the display, and they stop for 2-3 seconds while reading back the 8192 PID values only at the used ports.

Reading back the PSI Inserter program

The device comprises 12 Output Inserters for each remultiplexer, their programs can be read back separately. For starting the reading back, check in the pull-down list the one you want to read back. The read back program can be viewed on the Data Rate page, in the table of the PSI Inserter Program Editor. Save it in file, if you want to use it later. The setting data of the Output Inserter are shown on the Diagnostics page.

7. Using the ASI Remultiplexer (CW-485x) Programmer

Besides programming the IP-input remultiplexers the SW-4952 software support the programming of the CW-485x series ASI-input devices as well. The ASI Remultiplexer Programmer is available by setting the 'View CW-485x TS Remultiplexer Controller (ASI Inputs)' mode. The picture in the lower left part of the Analyzer page also shows the connection between the software and the device and the routes of the data streams. On selecting any other settings the controls, menu items, etc., connected with the CW-485x types are disabled. The ASI Remultiplexer programmer comprises the following three modules:

- PID Filter Programmer
- PSI Inserter Programmer
- General Settings

The program of the PID Filter Programmer and the PSI Inserter Programmer can come from the TS Constructor module, from a loaded file or from a device by reading back. Before loading, the software automatically save the program of the PID Filter in the PIDfilt.dpf file and the program of the PSI Inserter in the PSIpgm.da file. The course of the programming and the setting of the data rate and format is the same as known from the SW-4851B software.

Supplementary information:

The PID Filter Programmer demonstrates the current program in a table but does not allow modifying the data. When saving into file the program of the table will be saved, the program read from the file and the program read back from the device get into the table automatically. For storing the programs the software offers the ... \ASI_PGM subdirectory in the source directory, the automatically saved programs also can be found here.

The PSI Inserter Programmer can load in the PSInfo.dat and the PSIpgm.da type files as well. The identification of the PSInfo.dat file happens with the word 'CableWorld' which can be found in the header. The PSInfo.dat type files will be automatically converted into PSIpgm.da type files and then the software will work only with this and the read back program also will be saved in this version. (Note: At the PSInfo to PSIpgm conversion the automatic function tries to set the greatest PAT-PMT:SDT:NIT ratio (32:4:1), so the size of the program to be made is usually greater than which is made by the SW-4851B software at manual setting.)

In the General Settings module the querying of the settings/preset values is performed with the program of the Diagnostics module, since a number of other parameters will be queried, so the querying time is 5 to 8 sec. Remember, that the setting of the NCO determining the output data rate and the packet format will be started only by clicking the 'Set NCO and Format' button. The successful entry will be acknowledged. The command for switching out and in the PCR corrector will be started by the buttons immediately.

8. Data Rate & PCR Corrector – calculating and adjusting the data rate

The Data Rate Platform can be used for setting only the CW-495x type IP-input remultiplexer. The Data Rate and Packet Format Programmer always programmes the output (1 ... 4) selected in the 'View' menu item. The data rate of the CW-485x type ASI-input remultiplexers can be set on the ASI Programmer page.

The Data Rate Computer helps calculating the data rate required for the high frequency modulators. After setting the modulation characteristics, the data rate value to be set is shown in the 'Computed Data Rate' box. On clicking the 'Apply' button by the box, the software sets the parameters to be programmed. On clicking the 'Apply' button by the 'User Defined Data Rate' box, the software computes the value of the NCO and the PLL frequency to the data rate has been typed in the box; it is the 1/8 part of the data rate value.

The CW-495x IP Remultiplexer & Streamer offers two ways for generating the output clock signal. At using the NCO (Numerically Controlled Oscillator), the clock signal can be adjusted in a wide range (120 Hz – 25 MHz) and in very fine steps (1 Hz), but the NCO jitter is 8 ns. In most cases and with IP output this way is suggested. The integrated PLL circuit operates with a small jitter, but its frequency range is smaller (787401 Hz – 25 MHz) and the raster depends on the frequency. The software shows the available values. We suggest using the PLL for generating the modulating signal of the jitter-sensitive high frequency modulators.

At the start of executing and after executing the 'Load Settings from ...' command the SW-4952 software shows the settings of the NCO Frequency, PLL Frequency, Packet Format and TS Clock Source stored in the ini file. On clicking the Query button these data will be changed to the data read back from the device. The Query button on the Data Rate Platform is fully identical with the Query buttons of the other platforms.

Programming the prepared data starts by clicking the 'Load Data Rate Pgm' button, but the software asks for verification. During verification the new data rates are displayed in details.

Supplementary information:

The IP Remultiplexer comprises oscillators of two kinds for creating the output transport stream. The oscillator named NCO, generates the clock signal from the signal of a 125 MHz crystal oscillator. The advantage of the NCO, that its frequency can be adjusted between 120 Hz and 62,5 MHz (the 62,5 MHz value is limited to 25 MHz by the SW-4952 software) in 1 Hz steps. But the period of the adjacent clock signals may differ with 8 ns, i.e. the typical jitter is 8 ns. Generally the use of the NCO is suggested.

The oscillator named PLL operates with a low jitter integrated circuit (CDCE 949 Texas). The disadvantage is, that its frequency range is much narrower, the frequency raster is non-linear and depends on the generated frequency value. At using the PLL, type the required value and check, if the value after processing the data is suitable for us. At IP output it is no good using the PLL. The advantage of the small jitter can be exploited at ASI and parallel outputs.

Switching off and on the PCR Corrector

The CW-495x type IP Remultiplexer & Streamer comprises a statistical PCR corrector for eliminating the heavy PCR errors from the IP network. The number of the integrated PCR correctors is 8192, that is the hardware can handle every data stream comprising a PCR, separately.

The mass of data belonging to the PCRs is stored in a SDRAM, the new PCR values are computed by a fast FPGA module. The off/on switch circuit of the PCR Corrector is the PCR Corrector Reset circuit in one piece; that is the complete correction procedure can restart with off/on switching. When the PCR Corrector is switched on, it completely rewrites the PCR data and tries to diminish the PCR error to under ± 500 ns. Generally we suggest keeping the PCR corrector switched on.

Supplementary information:

The correction of the PCR error becomes critical, if the SDRAM stores a great amount of data streams and the actual PCR error reaches the order of magnitude of a second. The PCR Corrector restarts itself automatically, if the distance between the two PCR data exceeds the 728 ms value, or the detected PCR error is greater than 46 sec. In case of little errors, the correction of the internal 27 MHz reference oscillators stops transitionally, if the content of the SDRAM exceeds the size of 1024 packets.

9. Diagnostics – using the diagnostic module

The SW-4952 software allows inspecting the operation of this complex device in the IP-input and the ASI-input TS remultiplexers alike. As the operation of the two versions is quite different, so the structure of the two diagnostic modules is not identical either. The user can select in the 'View' menu the type he wants to work with. On selecting the CW-485x type, the diagnostic module of the ASI-input device appears, on selecting any other item the diagnostic module of the IP-input remultiplexer appears.

The continuous operation of the diagnostic module can start with the 'Run' button and stops with the 'Stop' button. The content of the diagrams and displays can be cleared with the 'Clear' button. On exit the diagnostic module the examination stops automatically.

By clicking the 'Diagnostics' button a Diagnostics Report (with text) can be made from the settings and operational states. The user can comment the report. The command required for saving the report in text file, can be found in the 'Save as ...' menu item.

For checking the operation, external software can run through the 'TS Analyzer' menu item. Running these pieces of software will be successful only, if they are installed in their default directories previously.

Supplementary information:

On the IP Remultiplexer & Streamer Diagnostics page four bar diagrams are shown above the block diagram. On clicking the RUN button the data of the diagram will be refreshed every second. The first diagram illustrates the amount of data arriving from the IP network and transferred by the Port Filter. The hardware counts the TS packets carried by the UDP packets, the display shows the data rate, as the product of the packet number and 188×8 . The diagram can show, whether the setting of the network and the IP Manager can ensure the required amount of data for the device.

The second diagram shows the amount of data of the four SDRAM placed after the four PID Filter. The four SDRAM operates in FIFO mode, at correct operation the SDRAMs store only a few packets (e.g. $1 \dots 2 \times 188 \times 8 = 1504$ or 3008 bits). In case of VBR stream, if the amount of data grows quickly, transitionally more packets are stored in the SDRAM. When the data do not fit in the output stream, the content of the SDRAM rises continuously and the output overflows. The output overflow is indicated by the 'Overflow' LED on the screen and on the front panel of the device. The inscription under the diagram shows the present input data rate of the selected SDRAM.

The third diagram shows the total amount of data inserted by the PSI Inserter. In case of overflow this amount of data transitionally decreases.

The fourth diagram shows the useful output data rate. The displayed value is the sum of the amount taken from the SDRAM and the amount inserted by the PSI Inserter. Under the diagram the size of the present free space is shown.

The diagram under the block diagram shows the useful output data rate as a function of time. The thin line in the diagram shows the possible maximum.

According to the checkboxes the diagnostic module decides, which one from the four remultiplexers will be preferred at displaying the data. We suggest checking only one box at a time. The timing diagram can be shifted with the right button of the mouse, and can be scaled up or down by the rectangle drawn with the left button (from left to right or from right to left).

Clicking the 'Diagnostics' button, a very detailed diagnostic process starts. The results are shown with text in the comment box, as well. The user can comment the results and can save them in a text file.

At evaluating the displayed data, consider that the device measures the data in packet/sec units. The data rates are calculated with the size of 188 byte/packet, so the lower digits may deviate from the expected value. In case of the ASI Remultiplexers the diagram shows the transferred data stream of the PID Filters situated after the 2, 4 or 8 ASI inputs. The bar diagram helps monitoring the operation of the ASI lines and the PID Filters. In case of Overflow the colour of the bar goes red. The 8-input remultiplexer comprises an internal remultiplexer too. The lower left part of the diagnostic page informs of the state of the Internal Multiplexer. The block diagram in the middle helps interpreting the displayed data. The lower right display informs of the operation of the Output Multiplexer and the PCR corrector. The display shows, how many from the 64 automatic PCR correctors have found a PCR data stream, in how many cases was the PCR correction unnecessary. Here you can see the number of the corrected and incorrigible values, as well. The Diagnostics Report shows more details of the data, there also can be seen which units from the 64 PCR correctors are operating in the moment of the examination.

The complete query of the 8-input remultiplexers happens in 7 phases, for the smaller ones in 5 phases. The progress bar in the lower left corner illustrates the phase of the query.

10. Additional information for those interested in deeper details

CableWorld Ltd cordially supports the users who are ready to integrate these hardware and software in their systems and complete them with their own solution. The next chapter was written for them and provides special information in their applications.

The content and format of the files used:

1. The structure of the 'ini' files corresponds with the structure of the initializing files used widespread. The content of the file can be completed and modified with any text editor. The 'ini' type files used for storing the data are as follows:

- Settings (SW4952a.ini) – The SW4952a.ini file comprises the default settings of the software, the assignment of the type number and the device name, and the Input IP Address List used last time. The software always automatically saves the settings to the SW4952a.ini file, so this name is reserved. The user can save the settings under other names and then load from there.
- Input IP Address List (*.ini) – The software allows saving the list comprising the 256 IP addresses in separate file or loading from there. It is practical storing the user's savings in the 'Settings\AddrList' directory.
- IP Connection List (Connect.ini) – This file stores the program of the IP Connection Manager. The 'Connect.ini' is a reserved name. Before loading it in the device the software saves the program loaded last time in the \IP_PGM\IPconPGM\Connect.ini file.
-

2. Before loading the PID Filter programs are saved automatically in the in the PIDfilt1.dpi ... PIDfilt4.dpi files. The *.dpi file starts with a 256-byte header, comprising the parts as follows:

- Starting with the byte '0': CableWorld identifier: CABLEWORLD LTD. PID Filter PGM-1 (max. 32 bytes)
- Byte 32: The length of the project name (0 to 144)
- Starting with byte 33: Project name (max. 144 bytes)
- Starting with byte 192: The date of creating the file (8-byte long, in Windows format)
- Starting with byte 256: 6-byte PID Filter data (Input PID (2 bytes) – Output PID (2bytes) – Port Number (2 bytes)). Important note: The data in the file starts with the LSB according to the Windows, i.e. the file structure differs from the data structure used at programming the device!

At loading in the file the software determines the amount of data by the size of the file, so the size is of great significance.

3. Before loading the program of the PSI Inserter is saved in separate files assigned to the 12 Output Inserters. The automatic saving comes to the Oins101.doi ... Oins412.doi files. The content of the file consist of 256-byte units. At this format also the first 256 bytes comprises the header data, and then the 256-byte units of the loaded program follow. The 256-byte units of the loaded program comprise the packets of 188-byte or 204-byte to be sent out, and the timing data and the CC controller as shown in Figure 6.2. The header identifier: 'CABLEWORLD LTD. PSI Program-1, followed by the identifier of the module performing saving.

The program of the Output Inserter is saved with extension 'ts' without header and control data in 188-byte version as well. This version allows examining the data stream with software of other manufacturers, too.

At creating the files with extension 'ts and 'doi' the software put 32 null packets at the end of the file but

this is not the part of the program any more. At loading in the files the software determines the amount of data by the size of the file; the size is of great significance. The 32 added packets always would be cut off.

At reading back the Output Inserter program, on the command 'ReadPSI' the device sends back the 256 bytes stored in the memory without modification. In the device memory the first 3 bytes form the timing data followed by the CC byte, then the 204 bytes of the packet and a $256-4-204=48$ byte long empty section follow. The SW-4952 software rearranges the data of the device's reply according to the format used in the Editor and the file.

4. The file formats of the ASI-input remultiplexer PID filter (*.dpf) and PSI Inserter (PSIinfo.dat, PSIpgm.da) files are the same as described in the former SW_4851 software. The first 8×1024 bytes of the '*.dpf' file correspond with the loaded program. The PSIinfo.dat file consists of the 204-byte TS packets, comprising the master packets for the packets to be generated. The PSIpgm.da comprises the loaded program.

5. The report of the input transport streams is saved in the Source.srp file. The file comprises a 4096-byte header and then the data of the transport streams in flexible ($n \times 1024$) sized units. The structure of the transport stream report (OutpTS_1.srp) edited by the user is the same, but comprises only the data of one transport stream following the 4096-byte header. The structure of the Table Report made by the software is the same, but some parts of the data arrangement are unlike. The structure of these three files is complicated, so it is not published, and it is not necessary for creating the user's individual software. The arrangement of the directories and data storages of the SW-4952 software is shown in Figure 10.1.

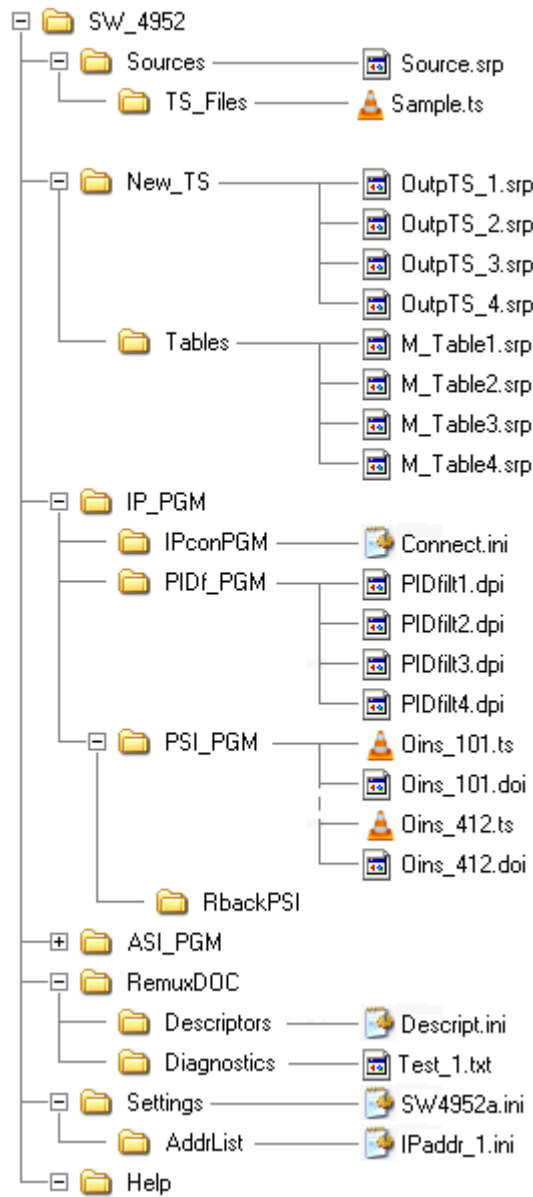


Figure 10.1
Structure of the SW-4952 software

The detailed instruction manual of the IP Remultiplexer can be downloaded from www.bytestudio.hu.

User's Guide for creating the lingual versions of the SW-4952 IP Remultiplexer Controller software with optional languages starting from the basic English

The SW-4952 software beginning with the 1.04 version, allows the user to determine the text appearing on the screen, i.e. to create an optional language version. The steps for translating the texts are as follows:

- During running the installer exe asks the language version the user wants to install. Then the Langu_1.ini file will be installed in the \Settings directory.
- If the software finds no the Langu_1.ini file, or the file is empty (e.g. at the English version), then the software displays the original English texts.
- The files comprising the Hungarian, Italian, etc., translations can be made continually. The perfect files are built in the installer exe by CableWorld. Anyone can try his own translation by replacing the Langu_1.ini file.
- Until the translation of the given language is not ready, the software installs a file where “?” appears instead of texts. In the file the translated texts must be written in the place of the question marks.

Creating the Langu_1.ini file:

Open the file with a simple text editor (e.g. Word Pad). The variables completed with letter “e” show the original text in English. The translated text must be written under this text, in the place of the question mark. Any other modifications in the data of the file, inserting notes, etc., are not allowed.

The text to be translated before the translation is as follows:

```
s200e=Save as ...  
s200=?
```

After translating it to Hungarian:

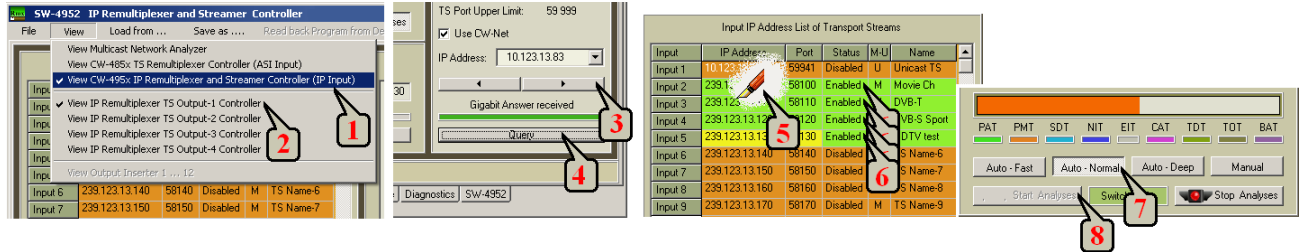
```
s200e=Save as ...  
s200=Mentés, mint ...
```

The content of the Langu_1.ini file is loaded in at the beginning of running the software. On copying the Langu_1.ini file to the C:\Program Files\CableWorld\SW_4952E\Settings directory and starting the software, the translation can be tested immediately.

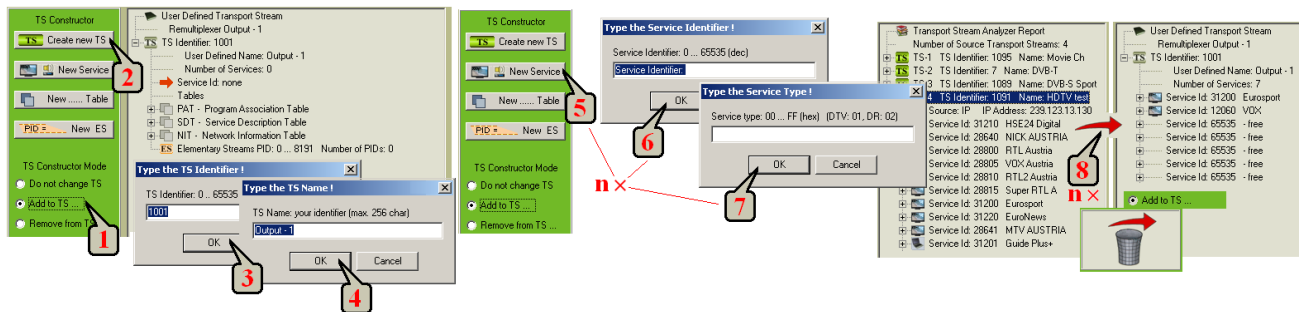
Testing of the multilingual version can be done in the SW_4952E directory. At the end of the test the former versions will be deleted and it will be available as version 1.04.

11. The remultiplexing process in pictures

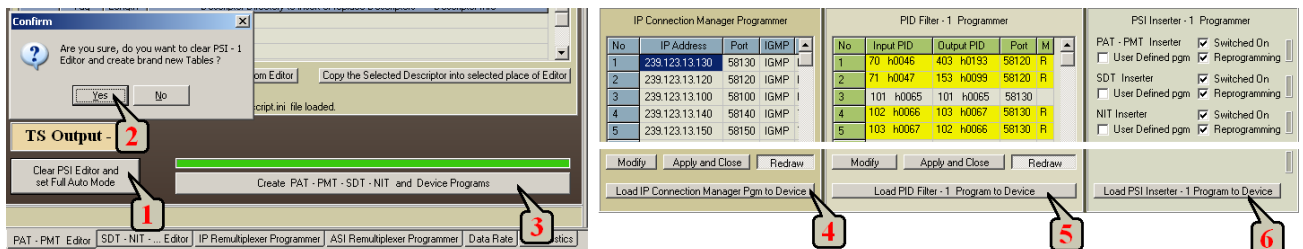
1. Analyse the input transport streams, before composing the output TS!



2. Compose the output transport stream!

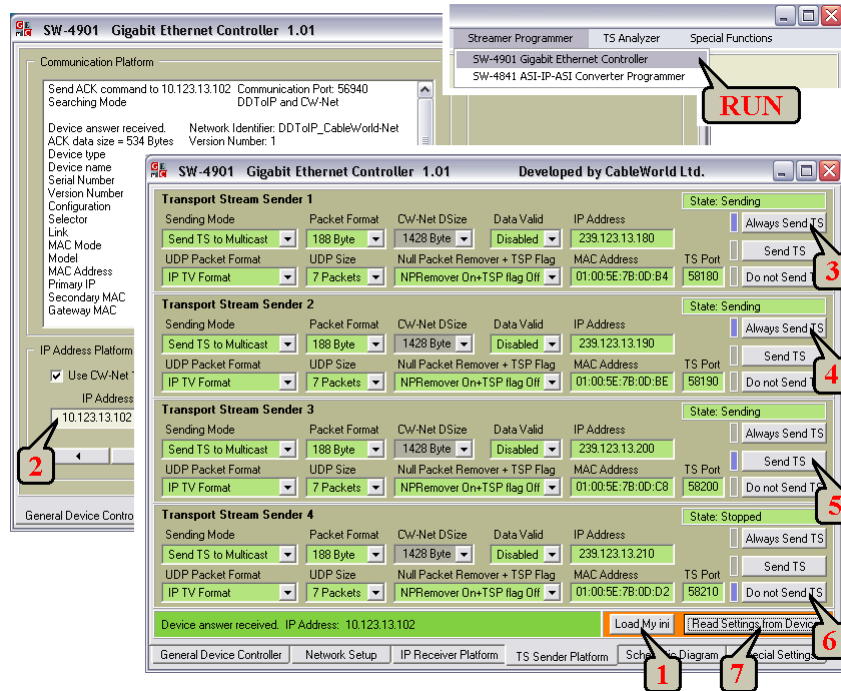


3. Create the tables and the device operating programs, and then load the programs to the device!



4. Check the operation of the device!

5. For IP-output device (CW-4951) configure the output streamer!



12. Frequently Asked Questions

1. How to start setting the remultiplexer?

First set an output data rate (e.g. 40 Mbit/s) and do not want more than build in one TV program in this data stream. Who has some practice in remultiplexing can try performing the task with the help of the pictures, but reading the big letter parts of the 'HELP' is suggested.

2. What is the most common mistake in using the software?

The software can be used for programming devices of different types but can be used without a device, too. The most common mistake is, that the user does not select the right mode in the first step. After installation the software is set to programming the CW-495x IP Remultiplexer & Streamer. If you want to work with a multicast network or program the former ASI-input TS Remultiplexers, switch over the mode in the 'View ...' menu.

3. What to do, if no transport stream appears during the TS analysis?

Probably, the mode selector in the View ... menu (View Multicast Network Analyzer – View CW-485x ... – View CW-495x ...) is not set properly. In the second step, check the right setting of the IP address with the 'Query' button. In the third step, make sure that there is signal in the IP network or in the ASI cables indeed. Who has no device or network nearby, can try operating the software by loading in the sample 'Source.srp' (Load Source Report (*.srp) from ...).

4. What can be wrong if at working with a multicast network the system does not work or works partially only?

In multicast systems it is not enough if the streams are of multicast type, it is also important that the switches applied can handle the IGMP messages. Probably, at the IP-input remultiplexers the use of improper switches will cause the problem.

5. What to do, if the menu items mentioned in the description are not accessible and appear dimmed in the pull down list?

The software allows calling only the commands that are applied in the given GUI. Change to another GUI, where the given command can be executed. The 'View ...' menu item affects the usefulness of the commands, as well. E.g. when selecting the GUI of the IP remultiplexer, the programming instructions of the ASI devices are not accessible.

6. How to make the Input IP Address List show always my network data?

Rewrite the data of the SW4952a.ini file with an optional text editor or type the data in the rows of the table (pushing the Enter button after every piece of data) and then save settings and exit. The software always starts with the data saved last.

7. What to do, if the data will not be built in the output TS at creating the TS?

Select the 'Add to TS ...' mode for creating the TS. The adding is successful only, if an equivalent element is inserted in an equivalent place. You have clicked the right place, if the software asks for confirming the insertion. Create empty places with the operation 'Add New Service' for building in the services (programs) and put the selected service in here. Use the 'Remove from TS ...' function for removing the empty places or unnecessary services. Important note: The 'Remove Service' function removes the elementary streams permanently and takes no notice if it is used by another service. In case of complex TS, instead of 'Remove Service', rebuild the stream!

8. What are the steps of the simple remultiplexing?

Analyse the input signals

Assemble the desired TS with the TS Constructor

Have the tables and the programs created automatically by clicking the 'Create PAT – PMT ...' button

Load the following programs to device:

IP Connection List

PID Filter Program

PSI Inserter Program

9. When should the IP Connection List program be modified?

The device calls the data streams from the IP network according to the IP Connection List. The list is to comprise the total data of the four remultiplexers. The IP Connection List program is to be loaded to the device again, if you want to take data from such a multicast data stream, which is not on the list. If any of the data streams are on the list redundantly, it causes error only at the overload of the gigabit line.

10. Can the tables be switched off and on simply, without programming?

Yes, the device comprises 4×12 PSI Inserters. Each of them can be switched off and on with one command without changing the program inside. In case of the SW-4952 software the switching off and on comes with the 'Load PSI Inserter Pgm' command

and the software programs all the 12 switches according to the current setting. The SW-4952 software uses only the first three inserters, the automatic function keeps the others always switched off. When you want to program only the switching off and on, all the Reprogramming checkboxes must be unchecked.

11. How to set the output data rate and format?

The device offers an NCO and a PLL circuit for generating the clock signal. In case of IP output it is not important which one you will select. At ASI output the PLL jitter is much less, but the frequency range of the NCO is much greater. The data in the device can be read out with the 'Query' command on the Data Rate page. The new data can be written in by clicking the 'Set Data Rate Pgm' button. The Data Rate Computer helps setting the data rate in the different modulation modes.

12. What to do, if the created tables and programs look defective?

The most common case, when the user assembles a transport stream, and then starts creating the tables and programs but in the meantime goes back to the TS Constructor and modifies the TS. After modifying the Constructed TS, clear the PSI Editor and start creating the tables again. Omitting the clear can cause errors. The error depends on what is modified. In every case when the programs or the tables are defective, clear the PSI Editor and start the creation again with the 'Create ...' button.

13. How to create an IP TV data stream?

Set the output data rate to 8 to 16 Mbit/s ($f=1$ to 2 MHz) by the NCO. Put in one TV program and configure the remultiplexer. Configure the output streamer for sending multicast data stream and removing the null packets. Remember: The output streamer is at another IP address, it differs from that of the input. In large systems it is practical to use a password for locking the programmability of the streamer (See the Help file of the SW-4901).

14. How to configure large systems?

In large systems, when 5, 10 or more remultiplexers must be configured, configure them separately. For this, connect the PC to a device via switch, and then connect the switch to the large network with a cable, that can be easily disconnected. In this arrangement configure the devices one by one, and build them in the large system only when you checked their correct operation separately. In large networks among many data packets it is difficult finding, checking the IGMP messages and other data packets, and troubleshooting the incidental errors.

15. After successful programming, how can the files be saved simply, in order to carry on the work and modify the data later, without restarting the remultiplexing?

The simplest and safest solution is copying the complete 'Programfiles\CableWorld\SW_4952' directory to the storage area used for saving, and starting the 'exe' file from here later. The content of the directory can be copied as many times as required. At programming several remultiplexers, assign separate directory to every remultiplexer. The files and the programs can be saved and recalled separately. So the programs can be exchanged among the four remultiplexers, but it requires the knowledge described in the user's guide.

16. Why does the loading process break here or there when loading in PSI programs of large size (a few Mbytes)?

In the IP Remultiplexer input controller, the execution of the operating state commands has higher priority than the programming commands. In a remultiplexer system it can be programmed during operation as well, but during loading data streams of large size (e.g. IGMP Query message arrives from the network switch), the loading process can break. At data streams of small size on breaking the loading it is practical to restart loading immediately, it will probably be successful. When this is not enough, take out the remultiplexer from the network and connect it to a computer (e.g. directly or via small switch), so that it cannot get commands to be executed from another direction while loading in the program (e.g. it is unnecessary to answer the questions of the IGMP switch).

Because of the problem above, in large systems it is not practical to set small repetition time for the IGMP Query messages. We suggest setting repetition time of 30 to 100 minutes for the switches.

13. Using the CW-4856 Multiformat TS Remultiplexer Programmer

The build-up and circuitry of the CW-4856 Multiformat TS Remultiplexer is similar to the IP Remultiplexer. The main part of the remultiplexer is the ASI6 Remultiplexer Board with six parallel inputs. The first three inputs are connected to ASI interfaces each, the second three inputs are connected to the three IP receivers of the Gigabit Ethernet Controller. The device can receive the signals of the ASI lines and the IP data streams as well. The block diagram of the device is shown in Figure 13.1.

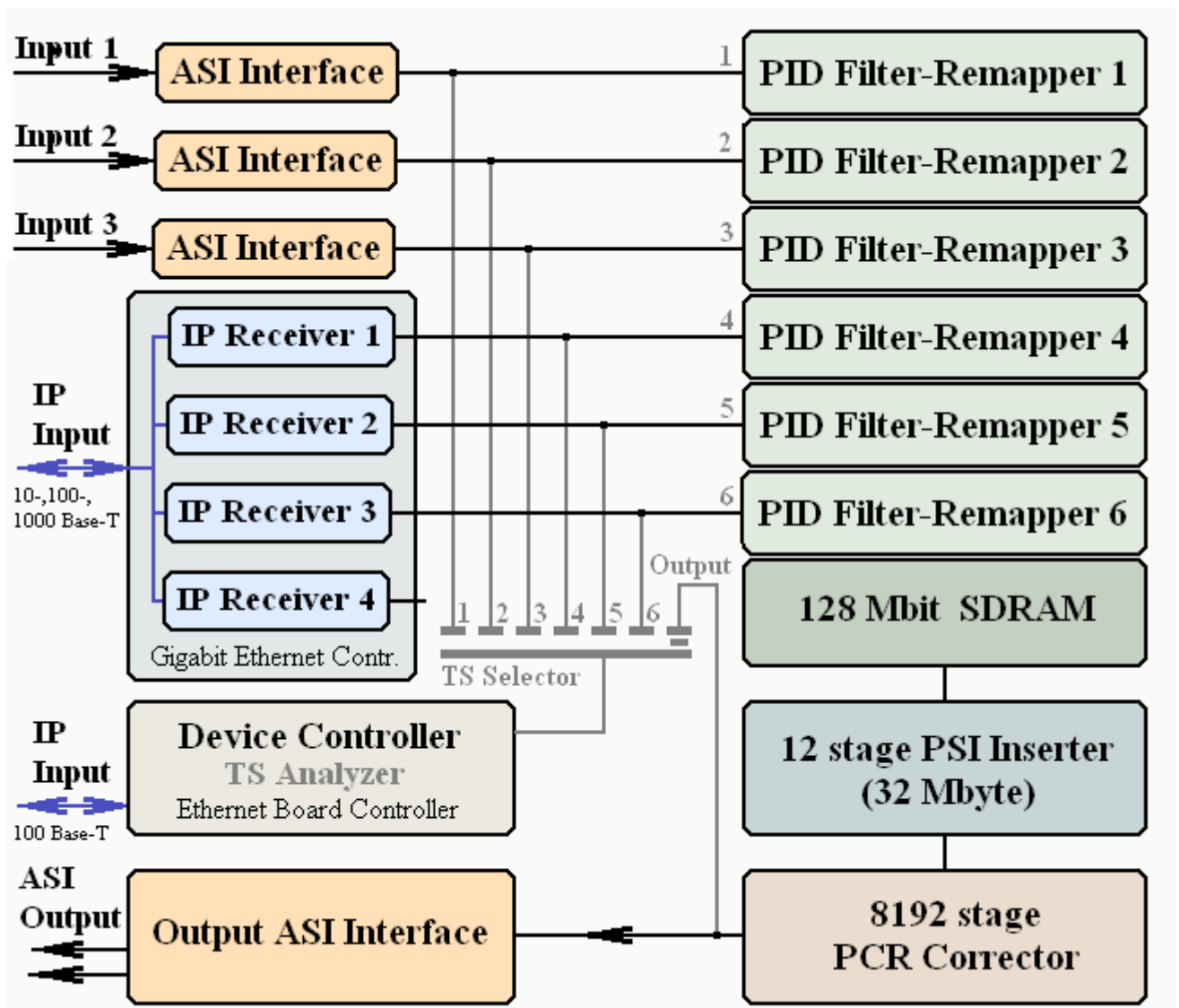


Figure 13.1
CW-4856 Multiformat TS Remultiplexer block diagram

The usage and programming of the A Multiformat TS Remultiplexer is considerably similar to the former types, so here the differences are described in detail only. Important note: the device has two IP inputs. The Device Control input can operate in 10Base-T or 100 Base-T mode, and the remultiplexer can be set and configured from here. The factory setting of this input is 10.123.13.101 IP address.

The transport stream is fed through the IP input, which can be operated in 10Base-T, 100Base-T and 1000Base-T mode. The factory setting of this IP address is 10.123.13.102.

The course of analysing the input streams is the same as described at the former four-input (CW-4854) and eight-input (CW-4858) remultiplexers, but the IP receivers (IP Receiver-1 to IP Receiver-3) must be configured with the SW-4901 Gigabit Ethernet Controller software in advance. The software allows using unicast and multicast connection as well. The remultiplexer unit can receive signals of the 188 and the 204 byte/packet format. The input signal can be burst (gated) and continuous stream as well. The course of configuring the IP receivers is described in the Instruction Manual of the SW-4901. The transport stream transmission over IP network is summarized in our publication 'Transport Stream Managing over IP', that can be accessed from the software.

Important note: The Gigabit Ethernet Controller sends the UDP/IP packets to the different signal processing units according to the Port Number. Common mistake at configuring the IP receivers, that the user configures no range for the TS Interval Port Number as the first step, and sends the transport stream to the device outside of the Port Number range. In this case the transport stream having been sent to the communication channel, will overload the the microcontroller of the communication channel and the device operates like a defective one (it answers the commands rarely and uneasily). In order to avoid this mistake, decide the Port Number range first and program its borders into the device. The communication Port Number must always be outside this range. The communication Port number can be modified in the ini file (the preset value is 56941).

The course of composition of the transport stream is the same as described earlier, so this question is not discussed in this chapter. The GUI for programming the device can be accessed from the View menu item.

The operation and programming of the PID Filter is the same as described at the IP remultiplexer. The program of the PID Filter can be edited manually as well. The program load will start after verifying the load request.

The programming of the PSI Inserter is the same as described at the IP Remultiplexer. In case of the CW-4856, due to the low bus speed, loading data streams of large size (e.g. set-top-box refreshing software of 1 to 2 Mbyte) takes much longer time, than loading through the gigabit line.

Setting the data rate and the input filters (General Filter), selecting the source of the transport stream clock signal and switching off/on the PCR corrector are performed with the buttons of the programming screen. The software always asks for verifying the request for the modification. The settings can be read back by the Query button of the programming screen.

On switching the PSI Priority function the inserting of PSI data gets an advantage over the other data of the transport stream. I.e. the tables will be sent out completely, meanwhile the picture, sound and other data streams are waiting in the SDRAM when necessary. In general applications the use of the PSI Priority function is suggested.

The instantaneous operating status of the remultiplexer is shown on the diagnostic page. When requesting for diagnostic report with text, the results can be saved in text file. In case of dynamic querying the user gets continuous information about the size of the input and output data streams, the incidental malfunctions and overflows.

14. Remarks, comments, further information

We are pleased to receive at cableworld@cableworld.hu comments and remarks related to our devices and software, which we may take into consideration at further developments. Further information on the application of our products can be requested at the same address.

CableWorld Team