

## **SW-4881 TS Generator & Inserter Controller 1.00**

### **Device controller and TS Generator Program designer software**

#### **Instruction guide**

The CW-4881 TS Generator & Inserter serves to deliver user-designed transport stream packets. The packets can be delivered as independent packets, as packets implanted in null packet series or as packets implanted in the free places of the input transport stream.

Functions of the SW-4881 software:

- Setting and querying the operation modes of the CW-4881 TS Generator & Inserter,
- Checkout, modification and loading of the user-designed program,
- Reading back and saving to file the program stored in the device.

The connection between the device and the controller computer is established by the CW-Net.

CW-Net is a 100 Mbit/s Ethernet network, which due the use of a special instruction set is referred to as CW-Net. The computer and the device communicate under Internet Protocol, in UDP/IP packets. The device and the computer can be interconnected directly through crossover cable, or indirectly via switch or other sophisticated switching unit through straight cables.

Technical literature about establishing and using the CW-Net:

CW_Net_.pdf	Basic knowledge of the structure and operation of the CW-Net.
CW_Net2.pdf	General description and block diagram of the CW-Net.
Using_CW_Net.pdf	First steps in putting into operation the CW-Net, configuring and testing the computer.
SW-4800	CW-Net Principal: software for setting IP addresses of the devices and checking up the function of CW-Net.
SW-4890	Computer Performance Tester: software for checking up the computer's set-up and performance.

Prior to starting the work with the device study the general instructions for putting into operation the devices in the Using\_CW\_Net.pdf description, and then read the instruction manuals delivered along with the device. The instruction manuals are available at the CableWorld web site, too.

Steps of installing the software and establishing connection with the device, in the simplest case:

- Install the software on the computer by running SW\_4881\_setup.exe.
- Set the computer to the 10.123.13.201 fix IP address.
- Connect the device to the computer with a crossover cable (100Base-T).
- Switch on the device.
- Note: All devices are shipped set to the 10.123.13.101 IP address.
- Run the software by clicking the icon on the desktop.
- Set the IP address in the software's CW-Net Connection panel to 10.123.13.101 and click 'Query'.
- If everything is right, the software immediately displays the name and type number of the device.
- The existence of communication between the computer and the device is indicated on the device by the 'LINK' green LED on the front panel; in case of data traffic the 'ACT' yellow LED blinks.

In case of error consult the Using\_CW\_Net.pdf description. For changing the IP address of the devices and for establishing and checking up the CW-Net, use the CW-Net Principal software. Until the connection between the computer and the device functions right, the work cannot be started. The structure and the partial operation of the software can be studied even without the device but no operation effects will be produced.

## **1. Installing the software, establishing the CW-Net connection**

The SW-4881 software is made available for the users free of charge; it can be downloaded from our web site by anyone who needs it. Installing is made in the usual way, by running the setup.exe. After installing, the icon of the software appears on the desktop and the software can be started with clicking the icon. The settings will be saved in the TSGen.ini file. The TSGen.ini file permits modifying some settings (e.g. the port number), which could not be modified in earlier pieces of our software. For those operating multiple devices we recommend operating the software from separate folders.

The CW-Net can be established using the widely applied 100 MBit/s Ethernet network components. The simplest network is the CableWorld device and the computer connected by their Ethernet connectors with a category 5 crossover cable.

Connecting multiple devices is made through a switch or some device of similar function. In this case each device must have a different IP address. The CableWorld devices are delivered set to the 10.123.13.101 IP address, and they must be set one by one to different new addresses, when connecting them to the network. Connect the computer with a straight (not crossover) cable to the switch, and then also with straight cable the first device. Set the device to the desired IP address, then connect the next device and set the IP address.

In the CW-Net network the computer has to be set to a fix IP address (e.g. 10.123.13.201) and to 100 MBit/s Full Duplex mode. In Windows XP environment follow the My Computer > Control Panel > Network Connections > Local Connection > right mouse button: Properties > Internet Protocol TCP/IP > Properties path to access the IP address setting option. The offered (255.0.0.0) subnet mask is suitable. Back to the same General page, on the top of the page the network manager device can be set: after clicking 'Configure' in the 'Advanced' page click from the 'Property:' list 'Link Speed/Duplex Mode' and select in the 'Value:' pull-down list '100Mbps/Full Duplex' mode. In most cases 'Auto' mode is also suitable.

At choosing the Ethernet switch for the job, remember that for transmitting simple commands, e.g. for setting IP addresses any type may be suitable, but for transmitting the high speed transport stream industrial types are only suitable.

The IP address of the device can be set with the SW-4800 software. The instruction guide for the SW-4800 CW-Net Principal software is to be found in the Help of the software and also in the SW\_4800 Principal\_Help.pdf, which can be downloaded from our web site. Using the CW-Net and the way of communication with the device is discussed in descriptions, which can be downloaded from our web site, too.

## **2. Architecture of the CW-4881 TS Generator & Inserter**

The CW-4881 TS Generator & Inserter is built of a transport stream generator and a transport stream inserter with loop-through type ASI input and double ASI output. At its output the device delivers either the input transport stream supplemented by the inserter, or a transport stream generated independently of the input signal. The TS generator is equipped with two flash memories of 4 Mbytes each, one of them is always operating and the other can freely be written and read out. The transport stream generator outputs the packets stored in its memory with the timing preset in the program. Designing the program of the transport stream generator, compiling the content of the packets and assigning the desired timings are the tasks of the user. The block diagram of the device is shown in Figure 1.

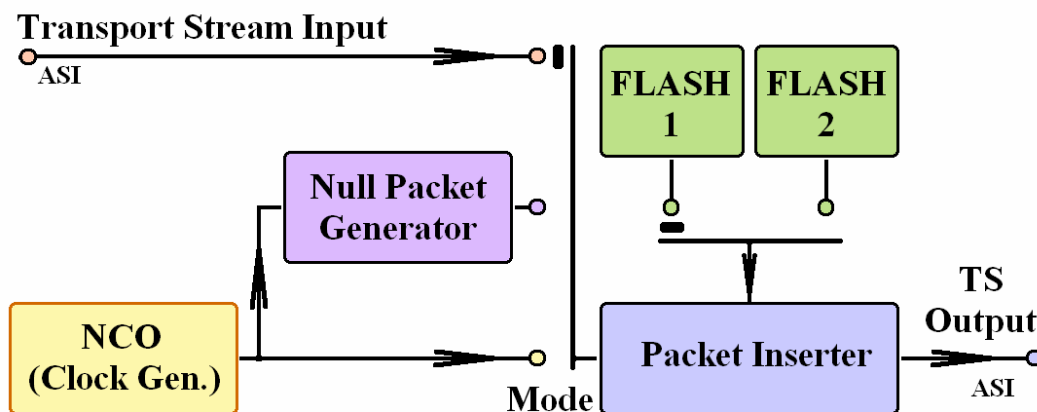


Figure 1  
Block diagram of the CW-4881 Transport Stream Generator & Inserter

The memory of the device has to be loaded with the prepared data stream. Speciality of this data stream is the first byte of each packet, which is not the h47 sync byte but the timing byte for implanting packet. The TS generator reads out the packets one after the another. First it waits for the time defined by the timing byte, and then it replaces the timing byte with h47 and starts outputting the packet.

The CW-4881 TS Generator & Inserter can be operated in following modes:

- **Packet Inserting:** The device checks the format (188/204) of the input transport stream and continuously inspects the transmitted packets. When the program offers from the flash a packet for implantation, the inserter waits for the next null packet of the input TS, and replaces it with the new packet. At 204 format the 188 byte format packet stored in the flash will be complemented with hFF bytes.
- **Continuous TS:** The device operates independently of the input signal; it generates a null packet series with the byte frequency determined by its own NCO (Numerically Controlled Oscillator). The packets read out of the flash by the program will be implanted in the next packet of the null packet series after the elapse of the programmed delay time.
- **Packet Burst:** In this mode too, the device delivers the packets read out of the flash by the program with the byte frequency determined by the NCO, but between two packets no output signal is delivered thus the output signal is of burst format. The distance between the bursts is determined by the timing byte, and the byte distance within the packet is determined by the NCO.

In the device setting of the operating modes is divided in two platforms. In one of the platforms settings are made directly, by commands sent to the hardware, whereas in the other platform settings are made by control codes built in the loaded program. The NCO frequency and the Clock Source switch can be set anytime, even during operation. The three basic operating modes and the formats and timings pertinent to them can be set through the program only. With beginner users wrong handling of these two platforms is the source of the most frequent errors, therefore users are advised to give emphasized attention to the above-mentioned.

**Note:** In the device the NCO frequency and the switch of the TS generator clock signal (Clock Source: input clock signal or NCO) can be set independently of the program stored in the flash memory. In the course of compiling the program for the device the right settings are ensured by the SW-4881 software. After loading the program, maintaining or possible restoring these settings is the task of the user.

The two platforms applied for setting the operating modes permits skilled users to generate specific signals, e.g. null packet series generated with an input clock signal.

A special feature of the CW-4881 TS Generator & Inserter is the synchronised switchover between the flash memories. This means that the switchover command will only be executed after the program of the operating memory has fully run off. This feature is especially important at sending out upgrade programs for set-top boxes, and at generating EPG and similar data streams, because it prevents the set-top boxes from freezing. Of course the program stored in that flash memory, which starts operation after the switchover, will be implanted beginning with the first packet.

### **3. Functions of the SW-4881 TS Generator & Inserter Controller software**

When running the SW-4881 TS Generator & Inserter Controller software, the introductory screen appears first. On clicking any point of the screen the device control and program loader screen appears with following controls:

**CW-Net Connection** In the descriptions of earlier CableWorld devices this platform has already been discussed in details, here a short introduction will be given only. On clicking ‘Query’ following device parameters will be queried:

- Type number, name, serial number and software version.
- Position of the flash switch.
- NCO frequency.
- Position of the Input-Output selector.
- Position of the ‘Clock Source’ TS generator clock signal switch (Input TS Clk or NCO).

For querying the device’s actual parameters and for checking up the connection with the device (especially in the learning phase) click often ‘Query’. At troubleshooting always start with clicking ‘Query’ and evaluating the response.

**Device Reset** Sending overall Reset command to the device. In contrary to the reset procedure at switching the device to line power, here the PIC circuitry of the Ethernet Controller that controls the procedure will not be reset.

**Input-Output Selector** After querying the switches (Query) their true positions will be shown. Switching over the position of any switch starts a complete operation mode change including also setting Flash1/Flash2 and Clock Source. Note: Because of the complex control, the selector of the TS Generator cannot be controlled with other items of software!

**Flash1-Flash2 Selector** After querying the switches (Query) their true positions will be shown. Switching over the position of any switch starts a complete operation mode change including also setting Flash1/Flash2 and Clock Source. Note: changeover of the flash memories is made synchronized: after sending out the change command the effective change will only be made after the operating memory has fully run off. The computer monitor always displays the state corresponding to the control code, and the front panel LEDs of the device display the actual state. With low data rates and long running programs the changeover may occur after quite a long time. In Packet Inserting mode an automatic circuitry prevents getting stuck in the lack of input signal.

**Closing the application** When closing an application, the software asks to confirm saving the settings. When exiting with 'Save and Exit', of course this will not be asked. This saving includes the settings only, saving the TS Generator Program must be done separately by the user!

**NCO Frequency** The SW-4881 software permits the NCO frequency to be programmed between 100 Hz and 10 MHz in 1 Hz steps. On clicking 'Query' the read out value is displayed in the 'NCO Frequency' box. When typing a new frequency value the colour of the box changes to yellow. On pushing 'Enter' on the computer keyboard, the software processes and writes back in the box the value according to its interpretation. The new value can be programmed in the device with clicking 'Set NCO Frequency'.  
Note: At reading out the frequency, values programmed in the NCO by other programs outside the above range may appear in the 'NCO Frequency' box. The device may operate with this frequency value, but this value cannot be programmed back.

**Working Mode** Changing the device's working mode initiates a complete working mode changing procedure including Flash1/Flash2 setting and Clock Source setting. Changing the working mode includes also sending out a command to actualize the source of the clock signal, but it does not directly influence the working mode of the device. The working mode of the device is set by the program stored in the flash memory.

**Packet Format** In Packet Inserting mode the user cannot change the format, the device automatically follows the format of the input signal. In Continuous TS and Packet Burst mode the format is defined by the user. The switches set the format through B1/D2 bits of the TS Generator Program. After loading the program the switch is inoperative.

**Clock Source** After 'Query' the device displays the source of the TS generator's clock signal. At changing mode the source from where the TS generator has to receive clock signal will be displayed and its right setting will also be done. At the first experiences with the device always have an eye on the position of the 'Clock Source' switch.

### **TS Generator Program Editor**

For operating the CW-4881 TS Generator & Inserter the user has to load in the device their own compiled program. The design of the program will be described in a separate chapter. The elaborated program can be loaded with 'Load from File' and the actual program can be saved with 'Save to File'. The details of the 'Load from File' procedure will be discussed at the design of the program.

**Load New TS Program** First load an elaborated program with 'Load from File'. Without this the software loads the actual program of the TS Generator Program Editor.

In the second step click 'Load New TS Program'. The software asks to confirm the procedure, and then it irrevocably starts erasing the free flash memory. Wait during the erasing and writing procedure with patience. Writing a shorter program can be finished even within 1 minute, writing larger programs can take even 15 minutes. The progress of the writing is shown in the displays. Do not break the writing procedure, because it results in wrong operation.

Notes:

The flash memory will be erased in one step; therefore the erasing procedure once started cannot be broken. At loading large programs it may occur that the user sees through to have made something wrong and would like to stop erasing. In such case the procedure can be broken by clicking 'Load New TS Program', but for restoring right operation a right program must be loaded. After breaking the procedure sending out a 'Reset' command is strongly recommended.

The programmer unit indicates the amount of loaded data in 1024 bytes packets, therefore between the size of the program and the indicated value a difference of 1000/1024 will occur.

Prior to loading, the programmer unit inspects the database to be loaded and marks the end of loading at the first 1024 byte part consisting of purely hFF bytes.

The time needed for erasing the flash depends on the parameters of the applied component, and shows a quite large deviation, but it is of no influence to the operation. The typical value of the loading is 300 kByte/min.

After writing the flash no automatic changeover occurs, activating the freshly loaded program has to be done by the user. The programmed but not yet activated state of the flash is indicated with violet colour.

**Read Flash** The program stored in the device can be read back with clicking 'Read Flash'. The software reads back the area loaded with program only, therefore reading back shorter programs ends earlier. Reading back lasts to the first 1024 byte UDP/IP data packet consisting of pure hFF bytes. The read back program is always written in the \Programs\FlashDat.ts file. On the user's command the read back program will be loaded in the TS Generator Program Editor, too. Breaking the read back procedure is not recommended either. Similarly to writing, reading back can also be broken with 'Read Flash', but in this case it is recommended to bring back the device in basic state by sending out a Reset command. Typical data rate of the read back is 300 kByte/min.

The read back data do not modify the mode setting of either the software or the device. The mode parameters stored in the read back data are shown by the Readback Data Analyzer. For setting the software mode according to the read back data, load the FlashDat.ts file.

For saving the program in small file size, after read back rename FlashDat.ts. The small file created by the SW-4881 containing useful data only and the file saved with Save to File containing the whole amount of data are equivalent. Smaller TS Generator Programs can easily be compressed; for sending through Internet, make use of this possibility.

Note:

'Load from File' and 'Save to File' buttons of the device control and program loader screen and that of the TS Generator Program Editor provide the same function.

The function of the Delay Time Unit will be discussed at the description of the TS Generator Program.

#### **4. Structure and functionality of the SW-4881 TS Generator Program Editor**

The TS Generator Program Editor is an integral part of the SW-4881; its structure and functionality is described in a separate chapter for the better intelligibility only. The editor of the TS Generator Program can be entered by clicking 'TS Program Editor'. Studying the functions of the Editor should be done reading the description and trying the particular functions simultaneously.

The TS Generator Program consists of 188 byte packets. The 4 Mbyte flash is capable of storing  $4 \times 1024 \times 1024 / 188 = 22\,310$  packets. The first 10 packets of the program is reserved for control purposes: this is the header of the program; thus the useful data content can be maximum 22 300 packets.

The data content of the useful packets can freely be written by the user, the device inspects the first byte only. This first byte controls the timing circuitry, prior to outputting the TS generator replaces this byte with h47.

The timing byte can be set to any value between 0 ... 239 (h00 ... hEF). The value of 255 (hFF) has a privileged role: it marks the end of the program, when reached, reading out starts from the beginning starting with packet 11. Any 'n' value within this range sets a delay of  $T = n \times T_{\text{Delay Time Unit}}$ , that is, the TS Generator will wait this period of time prior to outputting the packet. The timing of all 22 300 packets can freely be set by the user.

The basic unit of delay (Delay Time Unit) can be set between 0.2 ... 51 ms in 0.2 ms steps, however within a program its value cannot be changed. The value of the Delay Time Unit can be set after returning from the Editor, in the Working Mode Platform. For beginners using the 2 ms default value is recommended. Those skilled in using the system may freely set this value between 0.2 and 51 ms. When outlining a task mind that the lowest value of the timing byte is 0 or 0.2 ms, the highest value 12.2 sec.

Later it will be shown that the hF0 ... hFE range of the timing byte offers special possibilities for skilled users. Using this range is not recommended for beginners.

### Structure of the program header

The TS Generator Program Editor differentiates the header data, the first 10 packets with darker colour, indicating their privileged role. Exiting the Editor and then entering it again the header data will always be refreshed according to the actual settings.

The first 10 packets start with the h47 byte so that the TS analyzer programs can recognize the packets. Except for the first packet, the packets of the header start with the bytes h47, h1F, hFF, h1F.

In the CableWorld system the identifier of the program is the 'CABLEWORLD LTD. TS Generator Program' string starting with byte #5 of packet #9. By this the software recognises it as a complete program, carrying a header.

Starting with byte #5 of packet #10 the Project Name, the name given by the user can be read, supporting the user in orientation. Maximum length of the Project Name is 150 characters.

Byte #161 of packet #10 contents the length of the Project Name.

Starting with #162 of packet #10 the date of elaboration is given in Windows format, in length of 8 bytes.

Starting with #180 of packet #10 the value of the NCO frequency is given in integer format in a length of 4 bytes.

Byte #2 of the first packet sets the mode as follows:

D0	Packet Inserter Mode	0 – Packet insertion into the input stream 1 – Null packet generation
D1	TS Generator Mode	0 – Burst mode 1 – Continuous mode
D2	Packet Format	0 – 188 bytes/packet 1 – 204 bytes/packet
D3	Internal clock signal selector	0 – Direct burst mode 1 – Burst mode generated from continuous mode with gated clock signal (for special measuring signals)
D4	Reserve	
D5	Reserve	
D6	Reserve	
D7	Reserve	1 – Recommended value for causing the TS analyzer to indicate it as a defective packet

The value of byte #2 will be set by the software according to the following:

Packet Inserting	with 188 byte format: h82	with 204 byte format: h86
Continuous TS	with 188 byte format: h83	with 204 byte format: h87
Packet Burst	with 188 byte format: h80	with 204 byte format: h84

The TS Generator outputs the packets read out of the flash memory after a waiting time of  $n \times T_{DTU}$ , where  $T_{DTU}$  – is the Delay Time Unit, whose value can be set in the header to  $0.2 \text{ ms} \times (1 + B3)$ .  $B3$  is the value of byte #3, its value can be set in the SW-4881 software returning from the Editor to the main page, between 0 ... 254. For beginners setting  $B3 = 9$ ,  $T = 0.2 \times (1 + 9) = 2 \text{ ms}$  is recommended. Using the  $B3 = 255$  value leads to forbidden, defective operation.

Bytes #4 ... #18 are FlagBytes, where using h00 is senseless, therefore avoid it. The function of these bytes will be explained later.

### Timing of the packets

The user packets should be placed in the TS Generator Program after the header, starting with packet #11. The number of the packets can be any between 0 ... 22 300. The 188 byte packets except for the sync byte will be outputted without change. The timing code being placed in the place of the sync byte will be changed by the TS generator to h47.

The timing code located in the place of the sync byte can be applied in the TS Generator Program in a simple and a complex version. For beginners starting is recommended with the simpler version and after its successful use should be gone to the complicated version. The simple version differs merely in not using timing byte values in the hF0 ... hFE range.

In the simple version the packets read out of the flash memory will only be outputted after a waiting time of  $n \times T_{DTU}$ , where 'n' is the value of the timing byte, whose value can freely be set between 0 and 239 (h00 ... hEF). The value of 255 (hFF) has a privileged role, when reached, the software returns to packet #11 (Start Position) and starts outputting the packets from the beginning. Interpretation of the timing byte is shown in Figure 2.

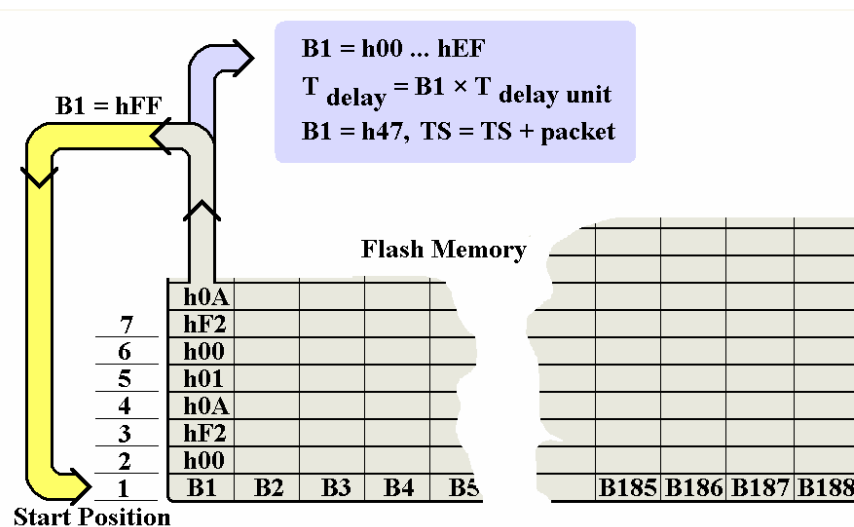


Figure 2  
Interpretation of the timing byte in the simple version



The complex version permits the packets to be divided in multiple groups by using flags, and their repetition to be specified embedded in each other, by means of their ratio. This version may most frequently be used for generating PSI tables, with a PAT and PMT table repetition time of x-fold the repetition time of the SDT tables and with their common repetition time of y-fold compared to that of the NIT table. Another field of use can be generating EPG data streams, where the short-term information (e.g. daily TV program) will be repeated more frequently than the long-term information (e.g. weekly TV program).

For dividing the user-compiled packets in part-domains 15 flags can be used. The flags are of equivalent value; their identifier is the timing byte between the values hF0 and hFE. To each of all 15 flags a FlagByte is assigned, whose value has to be given in the first packet of the TS Generator Program. To the flag marked with hF0 the FlagByte B5 is assigned, to hF1 the B6 and so on. The Editor clearly shows these assignments in the header.

To the flags a counter starting from h00 is assigned. When founding the hF0 ... hFE values, the timing byte evaluating unit detects having arrived to a flag and starting at this point it changes the way of its operation. In the first step it checks up if FlagByte belonging to the flag and the counter value belonging to the flag are identical.

If the two values are identical, it outputs the packet without delay and sets the counter to zero. Reading out and outputting the packets after the flag follows as it was done earlier.

If the two values are not identical, the packet starting with the flag will not be outputted, the packets will be outputted from the beginning, from packet #11, and the assigned counter will be stepped by one.

The version completed with the flags is shown in Figure 3. The TS Program Editor discriminates the flags with green colour from the timing data, and marks the relatedness of the flag and the FlagByte separately. The hFF code marking the end of the program will be painted with yellow colour.

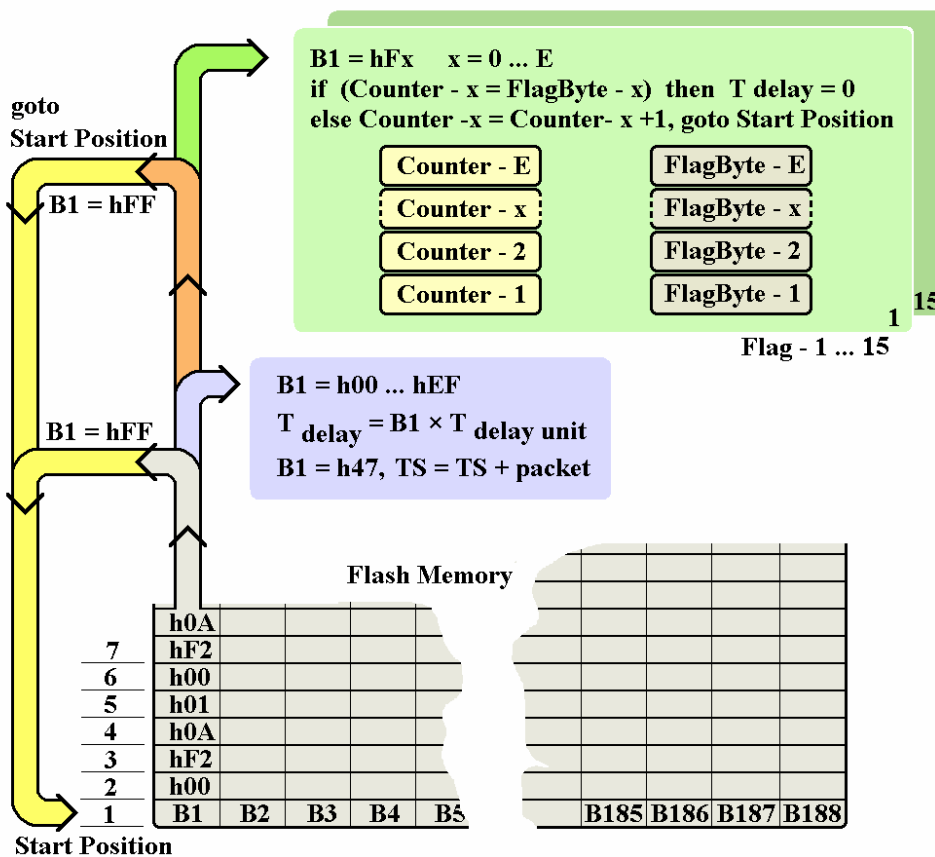


Figure 3  
Flowchart of the program completed with flags

**Notes and hints:**

- After erasing the flash memory all bytes are set at hFF, thus after writing the useful packets, the reversing signal is automatically in the memory.
- The Editor sets in the 4 Mbyte memory the last timing byte always to hFF to avoid fatal stopping of the program.
- A simple idea for setting 1 ms timing at T=2 ms: set the timing of the first packet to 0 and that of the second packet to 1.
- Setting a delay time beyond the value of  $239 \times T_{DTU}$ : Add between both useful packets the necessary number of null packets with  $239 \times T_{DTU}$  timing.
- The FlagByte of the unused flags can be of any value. FlagByte=0 gives operational state, but avoid using this in the finalized program.
- The repetition ratio of the procedures embedded in each other by flags will be  $1 / (\text{FlagByte} + 1)$ .
- When using flag, the synchronized changeover of the flash memories will be activated at returning to the next starting packet.
- Example1.ts and Example2.ts in the Program folder are two very simple examples for demonstrating how to design the program.

**Setting the NCO frequency**

In the Continuous TS and Packet Burst mode the device generates the transport stream by its own, using the clock signal of the programmable NCO. The signal processing within the device is byte-organized; one byte will be outputted on each clock. The conformity of the user-designed timings and the clock signal of the stream has to be assured by the user. For beginners setting 5 MHz clock signal is recommended.

Although in Packet Burst mode no continuous clock signal exists, thus the clock signal frequency has no direct meaning, the NCO frequency has to be carefully set even in this case, since the period time of the clock signal determines the distance between the bytes within the burst.

The value of the NCO frequency will be stored in the TS Generator program, this value will be shown in the 'NCO Frequency' box after loading the program; however this value has to be programmed in the device by the user with clicking 'Set NCO Frequency'.

Note: Skilled users can use the clock signal of the input ASI signal also in Continuous TS mode, if they load the Continuous TS program first, and after that they switchover the mode switch.

**Saving the TS Generator Program to file**

On clicking 'Save to File' the whole content of the TS Generator Program Editor will be saved; the file size is 4 Mbytes. Saving the whole content permits to store at unused areas data, which otherwise will not be loaded in the device.

**Loading the TS Generator Program file and other files in the Editor**

On clicking 'Load from File' the software inspects the file and proceeds as follows:

**4.1 Loading the TS Generator Program**

At the beginning of the file, when the software finds the 'CABLEWORLD LTD. TS Generator Program' identifier, it loads in the Editor the content of the file without any change. After loading, the controls of the 'Working Mode' platform are already set according to the data of the file.

**4.2 TS Sample**

When saving to file, the pieces of CableWorld software insert a 256-byte header in front of the transport stream to be saved. The header of the sample got by the TS sampler contains the 'CABLEWORLD LTD. TS SAMPLE' identifier. After finding this identifier, the software removes the header, and performs copying with inserting byte 257 into the beginning of packet 11. This procedure can be used for the direct insertion of IP TV and 188 format transparent TS signals.

### 4.3 TS Stream

Also at writing the TS directly to file, the pieces of CableWorld software insert a 256-byte header, which contains the 'CABLEWORLD LTD. TS stream' identifier. The way of insertion and the scope of application are the same as described in 4.2.

### 4.4 Loading any optional user file

If the software does not find any of the CableWorld identifiers, it inserts the first byte of the opened file into the beginning of the first packet and copies the content of the file in this way. In cases 4.2 ... 4.4 the content above  $22,300 \times 188$  bytes will be removed.

### Editing and correcting the TS Generator Program; using the Editor

The TS Generator Program Editor has been designed for surveying the finished programs, making smaller modifications and inserting the header. Preparing and inserting programs of larger sizes is recommended written to file. When using the SW-4881 software, the connection of the actual program (database) and the controls should clearly be seen by the user, therefore the structure of the software is shown in details in Figure 4.

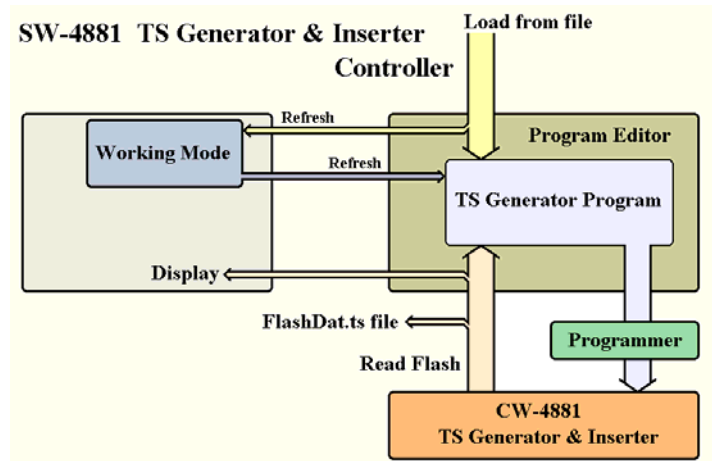


Figure 4

The connection between the SW-4881 software and the TS Generator Program in the particular working phases

In the Editor the bytes can be represented in hexadecimal, decimal and ASCII character format. During editing the format cannot be changed.

The Editor stores the program of 4 Mbytes size in a RAM, the part reproduced on the screen will be copied out of here. The vertical stepping of the packet position and the format change are made by repeated RAM reading with modified parameters. The packets shown on the screen can freely be edited, but writing these modified data in the RAM only occurs on clicking 'Compile Data and Insert into TS Program'. On clicking 'Undo' vertical stepping of the packets and format change will be permitted, but the original state will only be rewritten if an operation containing RAM reading is performed.

Clicking 'Clear-Start' in the Editor erases the whole RAM area and inserts the header. The header always contains the data of the actual settings. It is recommended to start loading the user program with this operation, and then load the content of the file. After modifying the settings on the main page, on returning in the Editor again the header data will be refreshed automatically.

If the user is not sure to have got in the program the data corresponding to the preset mode, on entering and exiting the Editor, refreshing is made automatically. The programmer always loads the data content of the Editor in the device, prior to loading no automatic refreshing of the operation mode occurs.

### **Reading back the program stored in the flash memory**

On clicking 'Read Flash' the content of the free flash memory will be read back in 1024 byte UDP/IP packets. In the course of reading back the software inspects the content of the packets. On finding a packet with entirely hFF content the reading stops. The read back data will always be written in the \Programs\FlashDat.ts file. At the end of the reading it can be decided to load the data in the Editor or only write them in the FlashDat.ts file.

When reading back more than one flash, savings can be made to different names by renaming the FlashDat.ts file, or through the Editor with the 'Save to File' function.

Be prepared to have saving times up to even 15 minutes when reading back files of larger sizes. Reading back always starts from the beginning. The procedure can be stopped with clicking 'Read Flash' but after that it is recommended to restart the device 'Device Reset'.

The read back data do not influence the controls of the 'Working Mode' panel, the settings stored in the read back data are only shown on the screen. When loading the read back data in the editor, they remain unchanged there until entering the editor first. For retaining the read back data in unchanged form it is expedient to save it to file.

After exiting and entering the editor again the header will be refreshed according to the actual settings of the 'Working Mode' panel, that is, the read back data will be modified. For setting the controls of the 'Working Mode' panel according to the read back data load the FlashDat.ts file.

### **Tools**

On clicking 'Tools' the tools supporting the editing and modification of the TS Generator Program appear. These tools have been designed for those users being not in the possession of software necessary for editing data being stored in file. The set of tools offers following facilities:

- Replacing the sync byte with any optional value.
- Inserting PAT table into Packet 11.
- Inserting PMT table into Packet 12.
- Inserting empty packets into any optional place by shifting the earlier ones.
- Removing packets by rearranging the remaining ones.
- Copying packets in any amount to any place.
- Inserting the frame for the NIT table into Packet 13.
- Calculating CRC and inserting it into any optional place within one byte, starting with byte #6.
- Calculating the data rate from the PCR data and detailed PRC timestamp analysis.

By combining the listed tools and using some petty ideas a wide range of editing operations can be performed. Remember to save to file the finished program so that after a possible faulty operation you have the original to return to!

### **5. Special information**

Those intending to design own software for operating the CW-4881 TS Generator & Inserter or for loading the software or software running in Linux environment need some further special data. For preparing the instructions listed in the CW-Net description, knowledge of followings is needed:

Control of the Input – Output Selector:

Input selection	Output1 byte D1=1
Output selection	Output1 byte D0=1

Control of Clock Source

Selecting Input Clk	Output1 byte D2=0
Selecting NCO	Output1 byte D2=1

Selecting Flash1 – Flash2

Selecting Flash1	Output2 byte D6=0
Selecting Flash 2	Output2 byte D6=1

Writing Flash

Flash memory address	6
Start erasing	with Enable On instruction (the address counter will automatically be reset to zero)
End of erasing	the device signalizes with ACK
Data loading	with Load Data instruction in 1024 byte packets
Closing data load	with Enable Off instruction

Reading the flash memory

Flash memory address	7
Address counter zero set	with Enable On instruction
Data read back	with Read Data instruction in 1024 byte packets

## 6. Remarks, comments, further information

We are pleased to receive at [cableworld@cableworld.hu](mailto: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.