

# DMR CPSProgrammer by DL5MCC

## Content

[What is CPSProgrammer](#)  
[Features and Limitations](#)  
[Installing](#)  
[Start the Program](#)  
[Concepts for Programming](#)  
[CPS](#)  
[Coding Channels](#)  
[Coding Scan-&roaminglists](#)  
[Coding Zones](#)  
[ini-File](#)  
[List Generator](#)  
[Downloads](#)  
[Codeplugs](#)  
[History](#)  
[Legal note](#)

## What is CPSProgrammer?

DMR (Digital Mobile Radio) is a digital voice (DV) modulation scheme, which becomes more and more popular in amateur radio (ham radio). To be able to use the radio transceivers, all frequencies (channels) used must be entered as a „memory channel“ into the so called codeplug (CP). There is a huge number of local radio repeaters, as well as analog FM repeaters and simplex frequencies, which all have to be entered into the CP by typing it manually into a programming software (CPS). Only in Germany we currently have about 150 DMR repeater, which expands to about 350 channels (2 timeslots + many mixed mode FM) only for DMR.

Programming this huge numbers of channels (callsigns, frequencies, timeslot & colour code, scanlist, RXGroup, TXContact, etc.) is a huge, boring and annoying pile of work, which can sum up to days. CPSProgrammer will make that work much more simple. All DV channels can be downloaded from the DMR database and than can easily be managed and extended by analogue channels, using Excel. A CSV file, to be generated from the Excel table, then will be used by the CPSProgrammer to program the channel information into the CPS.

CPSProgrammer directly accesses the CPS windows controls to transfer the programming information from the CSV-file into the codeplug. The automatic transfer of a few hundred channels into the Radio Programming Software takes a few minutes only.



CPSProgrammer requires a well prepared codeplug and a well prepared database (CSV), to be able to minimize your typing work on the codeplug.

## Features and Limitations

Automatic programming (programming robot) of the channel information of a CPS. Input from a CSV file.  
Currently supported CPS software:

- CS700 / DR7100 Radio Programming Software V1.25 (2015-06-04)
- MD380 Radio Programming Software V1.29.0, V1.30.0
- PD785 Customer Programming Software (CPS), V7.00.07.020.EM5

## Compatibility

Table: Compatibility and functionality, currently implemented

	Ch. DMR	Channels FM	Scanlists	Fill Scanlist	Zones	Roaming List
CS700	ok	ok	ok	ok	ok	n. a.
MD380	ok	ok	ok	ok	ok	n.a.
Motorola	planned	planned	planned	planned	planned	planned
PD785x	very slow	ok	ok	ok	ok	ok

## To Do

- Allow proxies for automatic software version check
- Automated writing of the Zones
- Read back from CPS and generate a CSV from a given codeplug

## Installing

Unzip all files of the download in a single directory. Thats it ...

The zip-file contains the following files:

- CPSProgrammer\_[versionnumber].exe: Executeable: Supports CS700 and MD380. Does NOT require admin rights
- CPSProgrammer\_[versionnumber]H.exe: Executeable: Supports **PD785x**, CS700 and MD380. **Requires admin rights** to be able to access Hytera's CPS. Programming speed is significantly lower, compared with CS700/MD380, due to slow CPS.
- channels-06.csv: A sample CSV, just for demonstration. Not for a real codeplug.
- scanlist-06.csv: A sample CSV, just for demonstration. Not for a real codeplug.
- CPSProgrammer.ini
- Prepared codeplug samples for CS700 / PD785G with scanlists, zones, RXgroups and TXcontacts, but without channels. This codeplug will intentionally cause warnings while programming, just to show how the software works.
- This page as pdf

## Sample and first steps

Just follow the description ("start the programmer") below with the CSV provided with the download ZIP-file, to get a first impression. You may analyse the CSV-file to get a better understanding of how this file controls programming.

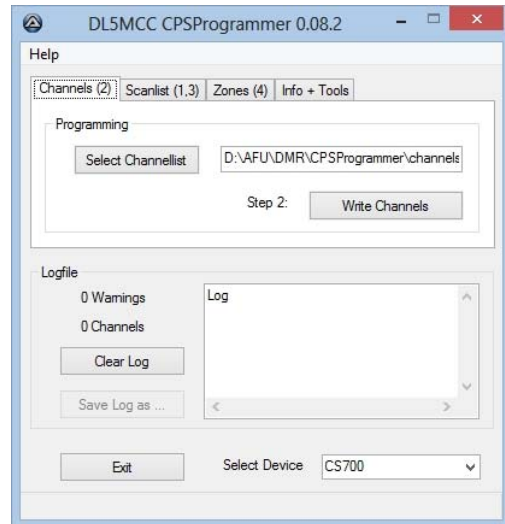
## Start the Programmer

To start programming, you have to perform some steps in the following order:

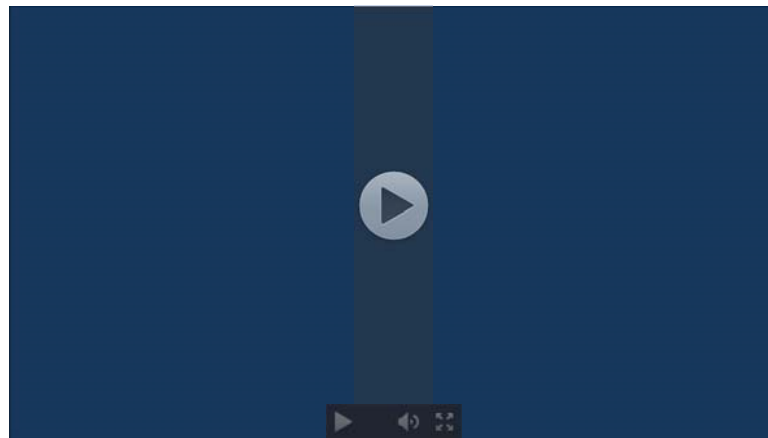
1. Open your Customer Programming Software (CS700/MD380 or Hytera radio programmer) and load a prepared codeplug, containing at least the required RXGroups and TXContacts (see

coding reference below for additional information).

2. The programmer allows you to create scanlists, write channels and fill scanlists.
3. Switch to the directory where you have installed the programmer.
4. Start the CPSProgrammer and switch to the function, you want to perform. Then select a CSV file, if you want to use another than the default one.
5. Normally you first create empty scanlists (step 1, required to programm the channels). Next you write the channel information (step 2). Once the channels are defined, you can fill the scanlists with the required channels (step 4).
6. Start Programming by clicking the related button, e.g. "Write Channels" or "Fill Scanlists".
7. Now, the Radio Programming Software gets focused, while all the information is automatically written into the codeplug.
8. **Note:** Should anything go wrong, **press CTRL+X** to pause the programmer immediately. Then select to continue or to exit the programmer.



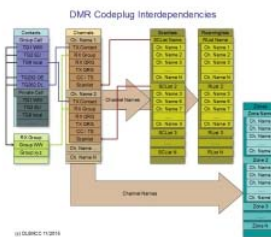
Main Menu of CPS Programmer V0.07.x



CPS-Programmer tutorial video  
More tutorials on [YouTube](#)

## Concepts Of Programming Codeplugs

Programming a codeplug requires a careful preparation of all the data needed. There are many fields to be filled with data and many interdependencies between these lists. To improve programming and to avoid unnecessary work, the interdependencies between different lists and fields in a codeplug should be known.



This picture shows the most important interdependencies in a codeplug ([click to enlarge](#))

A channel defines the RX- and TX-frequency, the ColourCode and TimeSlot, the Contacts and many other information used to communicate on a specific channel, as well as the display name. Some of this information, such as GroupCalls, RX-Groups or Scanlist-Names have to be defined before programming a channel, to avoid an unnecessary programming loop. For that reason, a specific order in the programming steps is recommended.

- First define all GroupCalls, which are the Talk-Groups used in your area (e.g. TG1 world wide, TG2 Europe, TG262 Germany). This step must be done manually.
- Second define at least one RX-Group which contains all Talk-Groups expected to be received on a single channel (check for a talk group matrix for the repeaters in your area. This step also must be done manually).
- Next we have to define scanlists. As we have not yet programmed the channels, the scanlists will be empty in the first step. The CPSProgrammer supports generating empty scanlists from a given csv. This is marked as step 1 in the CPSProgrammer.
- Having prepared TX-Contacts (a single talk group), RX-Groups (a list of talk groups) and empty scanlists, we are able to write our channels into the CPS. This is step 2 in the CPSProgrammer.
- Next we are able to fill our empty scanlists with the channels, we just have written into the code plug. This is step 3 in the CPSProgrammer.
- As a last step (step 4) we can create zones and fill the zones with the channels we have written into the code plug.

## Coding Reference for Channels

A tool providing help to create a channellist with proper coding for the CPSProgrammer is provided online:

[illegible]

Label	Values	[1]	Required_for	Description
callsign	text	x	DMR, FM	This is the callsign of the repeater which gets displayed in your transceiver, e.g. DB0RTA
qrg	number	x	DMR, FM	This is the frequency where your DMR transceiver will receive, e.g. 438.3525 or 438,3525
shift	number	x	DMR, FM	This is the shift of the repeater, e.g. -7,6 or 0 for simplex frequencies
cc	number	x	DMR	This is the number of the colour code, e.g. 1
mix	m, s1, s2 simplex	x	DMR	Defines, whether the repeater is a pure DMR or a mixed mode repeater. <ul style="list-style-type: none"> <li>• Leave empty for normal operation (TS1 and TS2 will be generated)</li> <li>• Must be "m" for mixed mode (TS1, TS2 and a FM channel will be generated)</li> <li>• If set to "s1" (single TS1) or "simplex", only TS1 will be generated, independt of a possible frequency shift other than 0.</li> <li>• If set to "s2" (single TS2), only TS2 will be generated, independt of a possible frequency shift other than 0.</li> </ul>
ctcss	number	x	DMR, FM	Frequency of the CTCSS signal if required. Any notation may be used (e.g. 88, 88.5 or 88,5. Also Digital Coded Squelc codes can be defined (e.g. D445N). <ul style="list-style-type: none"> <li>• For callsigns marked with mix=m, both CTCSS encoder and decoder will be programmed with the CTCSS frequency</li> <li>• For pure analog channels only the CTCSS encoder (TX) will be programmed</li> </ul>
net	text	x	DMR	DMR net. Used to insert characters after the callsign: dmr-plus: #, hytera: H, marc: M
0	any	-		Not required and not recognised by the programmer, but very usefull to keep the header line on top, when sorting the CSV lines in different order in your table calculation.
type	a, d		DMR, FM	<b>Defines the type of the cannell</b> , Enter <b>a</b> for analogue (FM) or <b>d</b> for digital (DMR) channels
callxt1	text		DMR	Additional description of timeslot 1, added to the callsign and displayed at the transceiver
callxt2	text		DMR	Additional description of timeslot 2, added to the callsign and displayed at the transceiver
txcontact1	text		DMR	Name of the default TX Talkgroup for TG1 in the pull down menu, e.g. TG262
txcontact2	text		DMR	Name of the default TX Talkgroup for TG1 in the pull down menu, e.g. TG9
rxgroup1	text		DMR	Name of the RXGroup for TG1 in the pull down menu, e.g. WW
rxgroup2	text		DMR	Name of the RXGroup for TG2 in the pull down menu, e.g. WW
tot	number		DMR, FM	Value of the Time-out timer, e.g. 300 (TOT now is defined in the ini-file)
pwr	h, l		DMR, FM	Power for this channel, set to h for high or l for low

scanlist1	name	DMR	Name of the Scanlist for TG1 in the pull down menu, e.g. munich-DMR (Also used to specify the Roaminglist for PD785x)
scanlist2	name	DMR	Name of the Scanlist for TG2 in the pull down menu, e.g. munich-DMR-FM (Also used to specify the Roaminglist for PD785x)
scanlistfm	name	FM	Name of the Scanlist for FM in the pull down menu, e.g. munich-FM. Also required for the FM channel of a mixed mode repeater (mix = 'm')

Generation of display names

Display names are made by concatenation of the *callsign* and *callex1* or *callex2* (depending on the TS). For special networks, an additional delimiter will be inserted before *callexN*: This allows you to distinguish between different networks, which use different talkgroups and operating techniques. Different delimiters can be configured by editing the ini-file. The following settings are provided with the default ini-file:

Network name ( <i>net</i> )	Delimiter
BM (Brandmeister)	&
DMR-DL	(none)
DMR-plus	#
Hytera	H
Marc	M
<i>Mixed-Mode FM</i> *)	%FM

Sample: **DB0RTA #1TG262**, where *callsign*: DB0RTA, *net*: DMR-plus, *callex1*: 1TG262  
**Important:** Please take care, that no channel name (e.g. DB0RTA #1TG262) occurs twice. CS700 programming software is not able to handle twice the same name and will respond with an error message, desynchronising the ongoing program run.  
\*) *Mixed-Mode FM*: This indicates a DMR-repeater providing FM mode on the same frequency as DMR. It usually transmits an CTCSS-signal on FM to allow an RX to suppress DMR signals.

Coding Reference for Scan- and Roaminglists

To automatically generate and fill scanlists, a CSV with a specific format is required. The file contains one line for each scanlist, starting with the name of the scanlist and followed by the channel names.

```
ScanList;Ch1;Ch2;Ch3;Ch4;Ch5;Ch6;Ch7;Ch8;Ch9;Ch10;Ch11;Ch12;Ch13;Ch14;Ch15;Ch16;Ch17;Ch18;Ch19;  
Ch20;Ch21;Ch22;Ch23;Ch24;Ch25;Ch26;Ch27;Ch28;Ch29;Ch30;Ch31{line-break=@CRLF}  
MUC-DRM-FM;DB0NJ TS1;DB0NJ TS2;DB0TVM #TS1;DB0TVM #TS2;DB0PUC HTS1;DB0PUC HTS2;DB0RTA #TS1;  
DB0RTA #TS2;DB0RTA %FM;DB0FSG HTS1;DB0FSG HTS2;DB0HKN TS1;DB0HKN TS2;DB0PME TS1;DB0PME TS2  
;DB0AAT #TS1;DB0AAT #TS2;DB0AAT %FM;DB0ESS #TS1;DB0ESS #TS2;DB0ESS %FM;DB0ESS #TS1  
;DB0ESS #TS2;DB0ESS %FM;DB0ANN TS1;DB0ANN TS2;DB0FUE TS1; DB0FUE #TS2;DB0ET #TS1  
;DB0ET #TS2;DB0ET %FM;{line-break=@CRLF}  
Bodensee;DM0ESS #TS1;;;;;;;;;;;;;;{line-break=@CRLF}
```

The only recognised labels are "scanlist" which contains the name of the scanlist, and "ch1" through "ch31" which contain the channel names to be added to this scanlist (**Note:** channel 32 is the selected channel itself). If less than 32 channels are added, the channelname is a zero-string "", which means that it's just followed by the next semicolon ";". As an example, the scanlist "Bodensee" contains only one channel.



To generate scanlists, you may comfortably use [DO1JG's scanlist & zonelist CSV-generator](#)

For a Roaminglist the same structure is valid, as for a Scanlist. The keyword in the CSV, line 1 is "RoamList". Please note, that roaming is not supported by all devices.

Coding Reference for Zones

To automatically generate and fill Zones, a CSV with a specific format is required. The file contains one line for each zone, starting with the name of the scanlist and followed by the channel names.

```
ZoneList;Ch1;Ch2;Ch3;Ch4;Ch5;Ch6;Ch7;Ch8;Ch9;Ch10;Ch11;Ch12;Ch13;Ch14;Ch15;Ch16{line-break=@CRLF}  
Munich;DB0NJ 1TG262;DB0NJ 2TG9;DB0TVM #1TG262;DB0TVM #2TG9;DB0PUC #1TG262;
```

```
DB0PUC #2TG9;DB0RTA %FM;DB0FSG #1TG262;DB0FSG #2TG9;DB0HKN 1TG262;DB0HKN 2TG9;  
DB0TTB #1TG262;DB0TTB #2TG9;DB0PME 1TG262;DB0PME 2TG9;DB0AAT #1TG262{line-break=@CRLF}
```

The only recognised labels are "zonelist" which contains the name of the scanlist, and "ch1" through "ch16" which contain the channel names to be added to this Zone. If less than 16 channels are added, the channelname is a zero-string "", which means that it's just followed by the next semicolon ";".  
To generate zones, you may also use [DO1JG's scanlist & zonelist CSV-generator](#)

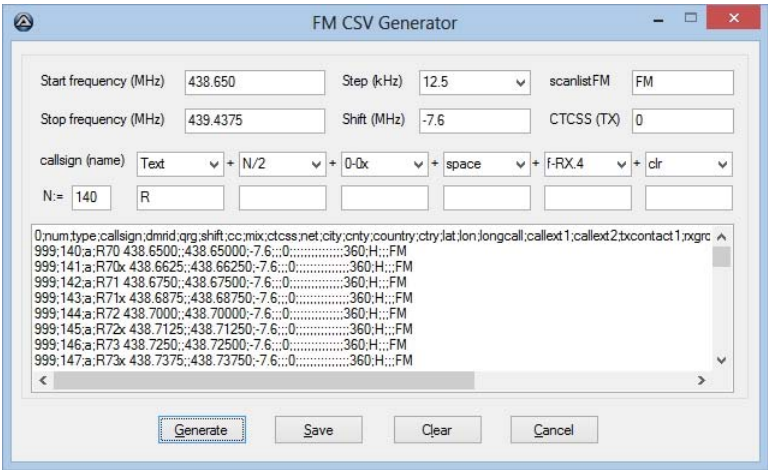
Ini-File

From version 0.05.1 on, the CPSPProgrammer may be individually configured with an ini-file, located in the same directory. The [General] section applies to the whole programm, while all the other sections only apply to a specific device, selected. The ini-file can be opened and edited with any text editor (e.g. notepad). The values provided below are default values, in case the related entry is missing, misspelled or the ini-file is missing.

[General]	
AutoCheckForUpdates=No	Yes/No: Set to No, to switch of automatic checking for updates
TXfmax=440	Upper band limit. TX frequencies above will generate a warning
TXfmin=430	Lower band limit: TX frequencies below will generate a warning
UseLastCSV=Yes	Yes / No: Open the last used files, when programm starts and save at exit.
channelsCSV=Drive/path/file.CSV	Last used channels CSV
scanlistCSV=Drive/path/file.CSV	Last used scanlist CSV
zonelistCSV=Drive/path/file.CSV	Last used zonelist CSV
[NetDelimiter]	
	Name of the net and delimiter, e.g. dmr-plus=#
netname=value	The delimiter signals the used network to the radio operator and additionally avoids double names, in case a repeater callsign occurs twice in the channel list (provided it is connected to different networks)
MixedFM=%FM	MixedFM defines the delimiter, appended at the call of a mixed-mode FM-repeater at its analogue channel, e.g. DO0JG %FM
[CS700]	
WindowTitle=CS700	Titel of the CPS Window (constant part only)
TOT=360	Time out timer (valid for all channels)
[MD380]	
WindowTitle=CPS MD_380	Titel of the CPS Window (constant part only)
TOT=360	Time out timer (valid for all channels)
[PD785]	
WindowTitle=Customer Programming Software	Titel of the CPS Window (constant part only)
TOT=360	Time out timer (valit for all channels)
GPSRevertChannel=Selected	Selected / None: Global setting for all channels.
RSSRevertChannel=None	Selected / None: Global setting for all channels.

List Generators

CPSPProgrammer provides list generators for DMR and FM channels, to automaticly generate channel-CSVs with consecutive frequencies, such as consecutive simplex- oder repeater-channels. Below is an example, how to generate the European FM repeater channels with its former naming pattern R70, R70x ... R101x (x equals 12,5 kHz offset). The naming pattern for repeater channels now is different, but this example shows how powerfull the channel list generator can be used.



The callsign ("channel name") to be displayed is generated automaticly and made by a concatenation of up to 6 input fields. The following functions are available for each of the 6 fields:

- N: Insert counter value, incremented by one, each line. Usually starts by 0

- Text: Insert text, entered in the input field just below the combo-field
- space: Insert a space " "
- N, N/2 ... N/16: Insert an integer N, oder N/x (to generate x times the same number, e.g. N/2: generates 0, 0, 1, 1, 2, 2, ...)
- Nmod2 ... Nmod16: Insert the remainder of N/x. (e.g. N Mod 4 generates 0, 1, 2, 3, 0, 1, 2, 3, 0, ...)
- C1-3-5: Insert "Cx", cycling all odd numbers from 1 to 15: C1, C3, C5 ... C13, C15, C1, C3, C5, ...
- 0-0x: Inserts letter x, when N is an odd value (Used to generate R70, R70x, R71, R71x, ... in the sample above)
- clr: Insert nothing (clear)
- f-RX.5: Insert RX frequency with 5 digits, e.g. 433.58750
- f-RX.4: Insert RX frequency with 4 digits, e.g. 433.5875
- f-RX.3: Insert RX frequency with 3 digits, e.g. 433.587

The picture above shows the DMR CSV List-Generator, which allows to generate a channel list with consecutive frequencies. The sample shown here, will generate consecutive channels according to the [DMR-Find](#) scheme.

## Downloads

0.12.0	2016-01-17	Added an automatic CSV generator for consecutive DMR frequencies	<a href="#">CPSProgrammer_V0-12-0.zip</a>
Add ons:			
CSV	2016-01-17	Channel CSV to programme channels according to the <a href="#">DMRFind</a> scheme. e.g. display name "5C3" = Zone 5, Channel 3. Zones must be edited manually (e.g. 5C1 .. 5C15 must be added to a "Zone5 DMRFind"-Zone).	<a href="#">channellistDMR_DMR-Find</a>

## Codeplugs

Did you use the CPSProgrammer to create a codeplug and share it with other HAMs? Please let me know the link, to be provided here.

Country	Area	Description	Link
DE	t.b.d.	Be the first, to provide your link!	t.b.d.

## History

2016-01-17	0.12.0	Added a DMR channel-list generator, to generate CSVs with consecutive channel frequencies
2016-01-14	0.11.0	Added a FM channel-list generator, to generate CSVs with consecutive channel frequencies
2016-01-10	0.10.0	Added generating and filling of Roaminglists for PD785.
2016-01-07	0.09.6	Preparing roaming lists for Hyteras, Generating of empty roaming lists works
2015-11-20	0.09.5	Added writing / filling of zones, for PD785 (Hytera)
2015-11-15	0.09.0	Added new functions for PD785 (Hytera): - Writing analgo channels - Generating empty scanlists - Filling scanlists
2015-11-05	0.08.2	Added: Save last csv used. Tooltips for better description.
2015-10-29	0.08.1	Improved error handling; Check CSV-files on consistency before start (all columes required are available?)



2015-10-23	0.08.0	Added a function to generate and fill zones in the codeplug
2015-10-22	0.07.5	Added features and prepared writing of zones: - The value for the TOT, now is read from the ini-file instead of the CSV. - Use CTRL+x to pause the programmer. You may continue or exit the software - Mouse position 0,0 is no longer used to stop the programmer - Network delimiters are now defined in the ini-file - The network delimiters defined in the ini-file can be exportet into a CSV. To be used for the scanlist/zones generator
2015-10-17	0.07.0	Added features: - Supports the generation of scanlists from CSV, for CS700/MD380) - Supports filling scanlists wit channels from CSV, for CS700/MD380
2015-10-12	0.06.3	Added a new feature, to allow the generation of a singe DMR Channel using TS1 or TS2. Please check the <a href="#">table above</a> to see the new labels and features. Download will be provided with a new and updated CSV: channels-06.csv
2015-10-11	0.06.2	Added GPSRevertChannel and RSSRevertChannel for PD785 programming. Both to be configurated in the ini-file.
2015-10-10	0.06.1	Improved channel programming of PD785 in way, that no delay value has to be defined any more in the ini-file. The Programmer automaticly detects, when the selection in the <i>Tx Group List</i> is finished.
2015-10-09	0.06.0	First version, supporting Hytera PD785 => V0.06.0H. (Due to the characterstic of the PD785 CPS, the H version requires admin rights. Perfomance (programming speed) is much lower, compared to CS700/MD380.
2015-10-02	0.05.5	Added features: - Output a warning when requested Scanlist, RXGroup, TXContact, CC, ... can not be selected as it is missing in the codeplug (e.g. you try to assign scanlist "Munich" to a channel, but you have not yet created a scanlist "Munich" in this code plug.) - Output a warning when transmit frequency is out of band. Band limits are defined in the ini-file. - Minor improvements for saving the log
2015-09-30	0.05.2	Bugfixed: Error-message when there is no internet connection (Auto check for updates); Cleanup the code
2015-09-28	0.05.1	Added features: - rudimentary ini file to switch on/of the update check (avoid problems behind proxies) - MD380 should work now (not yet tested on all of the TYT software versions, currently available)
2015-09-19	0.05.0	Enhanced GUI with new functions: - Added a log window. Content can be edited and stored as txt file. - Software checks for updates after start up. Download page can be opened with default browser - MD380 can be slected, but currently has no affect. / Warnings not implemented
2015-09-12	0.04.0	Software now comes with Windows GUI. - Significantly improved speed (300 channels in abt. 90 seconds, which took 10 Min. before). - CSV File can be selected before - Radio Programmer Software no longer has to be in foreground while programming. No more accidently influencing of other programms. - RXGroups, Scanlists and TXContact are no defined by their name. Currently - NO Logfile, NO Warnings.
2015-09-02	0.03.0	Added a function to support DMR simplex frequencies, indicated by mix = s.
2015-08-29	0.02.1	Minor changes in the display functions
2015-08-28	0.02.0	Changed the starting position to "channel name". Added consistency checks for all integer values in the CSV. Added CTCSS programming, Added a log file.
2015-08-20	0.01.0	This is the initial version of the programmer, which only supports the CS700 CPS so far. Runs in a terminal window and has no configuration features.

## Disclaimer and legal note

This software is a non comercial and experimental software for amateur radio (ham radio). It comes without waranty and with no support. The software is provided "as is," and you use the software at your own risk. I make no warranties as to performance, merchantability, fitness for a particular purpose, or any other warranties whether expressed or implied. No oral or written communication from or information provided by me shall create a warranty. Under no circumstances shall I be liable for direct, indirect, special, incidental, or consequential damages resulting from the use, misuse, or inability to use this software

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visitors since 2015-08-20