

# **DigiLite Serialiser v2.50 - SD Card Operation (v1.1)**

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## **Overview**

This version of the DigiLite serialiser software needs to be programmed into the dsPIC and adds the functionality to read pre-prepared transport stream (TS) files from an SD card.

The files are prepared on a PC, but the DigiLite does not need to be connected to the PC when the files are being transmitted from the SD card.

This software version works on the DigiLite serialiser / modulator PCBs and also on the separate DTU1141 serialiser PCB.

All the functionality of the non SD card version is preserved. DigiLite automatically switches to SD card mode when it detects the presence of a card. If DigiLite Transmit is running when a card is inserted, it will pause and continue when the card is removed.

About 40 minutes of transmission is available on a 2GB card using SR4000, FEC 3/4 on serialiser.

TS files are prepared with a separate program. The method of preparation is somewhat manual at the moment. In time, a utility will be available to make this easier. The program converts previously recorded (by GBPVR or another program) MPG files into TS files.

The SD card connects to the 10 pin header (JP1) on the DigiLite PCB. A small number of passive components are required.

A PCB design is available for an adapter board to take the SD card socket. This can either fit directly on to the 10 pin header, or be attached by a 10 way cable. There are very few components on the PCB, so it may be possible to put the SD card socket on plain board and wire directly to it from JP1 on the DigiLite PCB.

The separate serialiser PCB (DTU1141) has a position for an SD card socket to be soldered directly. The Farnell part number for the SD card socket is 918-6158 (also used on the adapter PCB). This is a full size socket. Mini and micro SD cards may be used with a suitable adapter.

A button is used to step through files on the card.

A switch may be placed in the connection from the Insertion Detect pin of the SD card socket, so that the card may be left inserted during live transmission. Several data lines are shared between the card and the FT2232H and some cards appear to load the bus before they have been initialised. With some SD cards, this may cause some corruption on live transmissions. If this occurs, close the switch to activate the card for a few seconds and see if that clears the problem.

## **Card Requirements**

2GB maximum

SD not SDHC

FAT16 file system, not FAT12, FAT32 or NTFS.

The card is not intentionally written to, but as it is sharing data lines with the USB module, it is recommended that a card dedicated to DigiLite containing no other important files is used. The write protect tab on the card itself may not be a reliable way to prevent the card being written to.

To check which file system is used on the card, put the card into a PC either directly or via a USB adapter, select MY COMPUTER, right click on the SD card Removable Disk, select Properties and look for File System.

If it says FAT, it could be FAT16 or FAT12. It is unlikely to be FAT12 if the card size is greater than 32MB.

If the file system is not FAT(16), the card must be formatted. Be very careful when formatting any drive in a PC, that you select the correct one. Formatting a drive will wipe all data.

## **Formatting an SD Card**

BE VERY CAREFUL. Formatting a drive wipes all data off it. If you have a dedicated PC for DigiLite, do it on that PC.

These instructions are for Windows XP. Other systems may be different.

Start MY COMPUTER

Rename the card to make it more distinctive. E.g. DL-SD-CARD

Remove the card and make sure that it disappears off the screen to check that it is the correct drive.

Re-insert the card and make sure that it re-appears.

Right click on DL-SD-CARD.

Select PROPERTIES and then FORMAT.

For FILE SYSTEM, select FAT16, or FAT if FAT16 is not in the list.

Tick QUICK FORMAT.

Untick COMPRESSION and BOOT DISK if shown.

Click START, check one final time that you are formatting the correct drive and then click OK on the warning box.

Check that the file system on the card is now FAT(16), as in the section above.

## **File Name Requirements**

DigiLite TS files must reside in the root folder (directory) of the SD card.

Valid file names are of the form DT\_ABCDE.#FX

ABCDE may be any valid Windows characters.

# indicates the symbol rate (SR) that the file must be transmitted at.

F indicates the FEC.

X = 1 indicates that the FEC needs to be applied. X = 0 indicates that no further processing is needed. This is determined by the FEC setting in DigiLite Config when the file is converted.

E.g. DT\_SHACK.431 = SR4000, FEC 3/4, the FEC needs to be applied.

## **Symbol Rate Characters**

The following characters are used to indicate the symbol rate (# in the section above):

1000 1	1333 B	1500 C	1667 D	2000 2
2500 H	3000 3	4000 4	4167 T	5000 5
6000 6	6250 Y	8000 8		

Operation above SR4167 is limited. Not all combinations of SR and FEC are available because of processor speed restrictions. In these cases generally, FEC on serialiser should be set when preparing the TS, even though DigiLite Config says that FEC on PC is recommended. The lower the FEC, the more likely it is to work.

If it appears not to work, go into extended debug mode (see later) and check if there are any resyncs.

## **File Selection**

If a PC is connected and DigiLite Transmit is running, make sure that Test Mode in DigiLite Config is not selected.

When the card is inserted, the first valid DigiLite TS file in alphabetical order is transmitted.

At the end of the file, transmission restarts from the beginning of the same file.

Pressing the button selects the next file in alphabetical order.

Holding down the button for one second selects the first file in alphabetical order.

If the button is pressed while transmitting the last file in alphabetical order, the first file in alphabetical order will be transmitted again.

There will be a short delay before a file is transmitted while the file is being prepared. This is proportional to the size of the file.

There will be a glitch in transmission at the end of the each file.

## **Carousel Mode**

Holding down the button for five seconds selects Carousel Mode, where all valid files are transmitted in sequence in alphabetical order.

After the last file in alphabetical order has been transmitted, the first file in alphabetical order will be transmitted again.

Carousel Mode may be automatically selected by putting a file named DT\_.CAR on the card. This file will be detected when the card is inserted.

There will be a short delay before a file is transmitted while the file is being prepared. This is proportional to the size of the file.

There will be a glitch in transmission at the end of the each file.

If the button is pressed when Carousel Mode is active, Carousel Mode is de-activated and the next file in alphabetical order is transmitted repeatedly.

If the main part of the file name ends with @ (e.g. DT\_F12@.431) it will be skipped in Carousel Mode. If such a file is being transmitted when Carousel Mode is activated manually, the next file in alphabetical order without an @ will be transmitted immediately.

## **LED Behaviour**

LED on and steady indicates that the card is being searched or the file is being prepared.

When a file is being transmitted from the card, the LED is mostly on, blinking off once per second.

Mostly off, blinking on 3 times indicates that there are DigiLite files on the card, but none with a valid SR and FEC.

Mostly off, blinking on 4 times indicates that there are no DigiLite files on the card.

Mostly off, blinking on 5 times indicates some other problem with the card. In this case, it is necessary to connect to the CONTROL port with Hyperterminal or another terminal program to view the debug information.

## **Debug Mode**

Stop DigiLite Transmit or leave it waiting for a recording.

Open a connection to the CONTROL port with Hyperterminal at BPS=57600, Data=8, Parity=None, Stop=1, Flow=None.

Insert the card.

Some status information is displayed - the name of the file being transmitted or error indications.

Hitting # toggles extended debug mode on and off. This displays more information and should be used when looking for problems. Try re-inserting the card after turning on extended debug mode.

Turn off extended debug mode and close Hyperterminal when finished. DigiLite Transmit will not be able to open the CONTROL port if it is still open in Hyperterminal.

## **Generating TS files for the SD card**

TS files are generated by using DigiLite TS Generator, which is a modified version of DigiLite Transmit, to process MPG files that were recorded by GBPVr or WinTV during live transmission. DigiLite does not transmit during the conversion.

The parameters set in DigiLite Config are used for the conversion.

Change the name of the previously recorded MPG file to something simple, but keep the .MPG extension. Your PC may not show the file extension, depending on how it is configured.

The program names used below do not show version numbers, as these may change. Use the full, correct name including the version number for the programs you have.

## **Converting a Complete MPG File**

To convert a complete MPG file, simply drag and drop or copy and paste the MPG file onto the DigiLite TS Generator program icon.

This uses the parameters from DigiLite Config, as for a live transmission.

Conversion is done faster than real time, without sending any data to the USB port.

A file called DT\_#FX is produced in the same folder as the MPG file\*\*, where F and X are as defined in the File Name Requirements section above.

Using the table of symbol rate characters above, change # to agree with the symbol rate set in DigiLite Config.

Add up to 5 characters after the DT\_ and copy the file to the SD card as required.

\*\* when using "DigiLite TS Generator v1-46" and later



## **Converting Part of an MPG File**

Converting part of an MPG file is more complicated. You need to find the start point and end point of the required part of the file manually by replaying it and looking at the TV. Eventually a utility will be available to do this.

Copy DigiLite Transmit, DigiLite TS Generator and CC3250MT.DLL to the folder where recordings are stored. This is likely to be C:\temp\Manual Recordings if GBPVR is installed. Make sure you do actually copy rather than move the files, or they will not be where you expect them to be for normal operation.

Look in your Windows folder for a folder called SYSTEM32 and in there find a program called CMD.EXE. Windows may hide this folder from you and may not show the .EXE extension, depending on how your system is configured. Copy CMD.EXE to your recordings folder.

Open your recordings folder and double-click CMD.EXE. A DOS like window will appear.

Find where you want the conversion to start by replaying the MPG file with an offset in MB and looking at the TV.

E.g. Type in "DigiLite Transmit" "recording1.mpg" 500

You can use the F3 and up / down arrow keys to retrieve and edit previous commands, to avoid having to type them in again.

A minute at SR4000 FEC 3/4 is about 40MB.

Find the required start point by varying the offset and then note the offset value.

Find the end point by the same method and note the AVAIL value.

Convert the file: E.g. type in "DigiLite TS Generator" "recording1.mpg" 620

Watch the AVAIL figure and hit ESC when it reaches the end point value.

A file called DT\_#FX is produced in the same folder as the MPG file\*\*, where F and X are as defined in the File Name Requirements section above.

Using the table of symbol rate characters above, change # to agree with the symbol rate set in DigiLite Config.

Add up to 5 characters after the DT\_ and copy the file to the SD card.

\*\* when using "DigiLite TS Generator v1-46" and later

## **Using TS files with and from Other Systems**

In theory, it is possible to use TS files generated by DigiLite with other systems and it is possible to use TS files generated by other systems with DigiLite, both with some limitations.

### **TS Files Generated by DigiLite**

For historical reasons, TS files generated by DigiLite with FEC on PC have the bits in each byte reversed in order. In DVB, bit 7 is transmitted first. With DigiLite, by default, bit 0 is transmitted first when using FEC on PC.

To generate a file with the bits in the correct order, on DigiLite Config, hold CTRL and hit F and tick the new item that appears 'FEC on PC (STD)'. The file produced will not be compatible with DigiLite. Live transmission with this setting will not work with DigiLite Serialiser v1-40.

Files generated with FEC on Serialiser have the bits in the correct order and should work with other systems. It is assumed that other systems work with the standard 'bit 7 first' order, but that is unknown.

### **TS Files Generated by Other Systems**

Assuming that other systems generate files with 'bit 7 first', files that have already had the FEC applied (DigiLite FEC on PC) will not work with DigiLite, but files generated to expect the serialiser to do the FEC will work.

The file must be renamed as in the File Naming Requirements section above. The file must be transmitted at exactly the same symbol rate and FEC that it was generated at.

e.g. A file generated at SR3000, FEC 5/6 should be have a name like DT\_TEST.351

## **Connecting the Button and Card Inserted Switch**

Note the comments in the overview that having the card inserted all the time may cause corruption on live transmissions. If this occurs, close the switch to activate the card for a few seconds and see if that clears the problem. With all the different SD cards that may be used, it may not be possible to use the switch facility with some of them.

The button steps through TS files on the card. If you want to have one file per card and use several cards, then the button is not required.

The card inserted switch can be used to leave the card inserted permanently. The switch is not required if you intend to remove the card when you want to go back to live transmission.

The switch can be connected to the SD card adapter PCB (see later) by removing LK91 and connecting the switch to the LK91 pads. Alternatively the switch can be connected directly to the DigiLite PCB as described below.

### **DigiLite PCB v5.6 and v5.7**

Connect one side of the button to GND and the other to IC2 pin 11 (dsPIC) via a 1k5 resistor. If you follow the track from pin 11, it goes to 2 vias near the USB module, which may be used as a connection point.

For the switch, cut the track that goes from JP1 pin 9 around the outside of the PCB to R7. Connect the switch to JP1 pin 9 and the end of R7 nearest the edge of the board. The square pad next to the JP1 text is pin 1.

### **DTU1141 Separate Serialiser PCB**

Connect the button to J9.

Cut the short track that goes from the SD card socket to R13 and bridge the cut with the switch.

## **SD Card Adapter PCB – DTS1010**

This single-sided PCB attaches to JP1 on the DigiLite v5.6 and v5.7 PCBs. The SD card socket is fitted on this PCB. J1 on the DigiLite PCB connects pin for pin to J91 on the SD card PCB.

It can be directly attached via a connector, or through a short 10 way cable. The top right corner of the PCB may be cut out for access to the pots on the DigiLite PCB, if it is directly attached.

Pin 1 (square) of JP1 on the DigiLite PCB attaches to pin 1 (square) of JP91 on the adapter PCB.

The size of the PCB is 61.9 x 37.1mm

LK91 can be replaced by the card insertion switch as described above.

R91 and R92 are 33k. They are only pull-ups, so anything from 22k to 68k should be fine.

C91 is 100nF for decoupling. LK components are wire links or 0R resistors.

All holes are 1mm, except H91 and H92 which are 2mm for the pips on the underside of the SD card socket.

The Farnell part number for the SD card socket is 918-6158.

The 10 way socket for JP91 fits on the under (non-copper) side of the DTS1008 PCB. A suitable 10 way socket is Farnell 341-9125.

J93 and J94 are provided to connect the bulkhead USB socket if used (Farnell 122-9686). The bulkhead socket needs to be filed down to allow the USB plug to be inserted far enough. GWR shows the position of the green, white and red wires. All USB cables seem to have the same colours.

J95 can be used to program the dsPIC in circuit. Pin 1 on the right is GND. It fits on the top (copper) side. J95 can be omitted if in-circuit programming is not required.

The DigiLite PCB should be powered up when the dsPIC is being programmed in circuit. On the DigiLite v5.6 PCB, a wire needs to be connected between pin 6 of JP1 to pin 21 of U2 (dsPIC) for in-circuit programming.

From RIGHT to LEFT, the connections on J95 are:

- |   |             |
|---|-------------|
| 1 | GND         |
| 2 | CLOCK       |
| 3 | DATA        |
| 4 | not used    |
| 5 | RESET / Vpp |

**Completed PCB (earlier version, 5 pin programming header not fitted)**



