DD emulator – Technical description

Heikki Korpimaa 29.1.2025

Dynamic Drum system on VHS recorders by JVC

JVC produced in the 90's and early 2000's VHS/S-VHS video recorder models with perfected picture search modes. The system that eliminates noise bars on all picture modes was called "Dynamic Drum System", hereinafter referred to as "DD" in this document. The system tilted the head drum for the heads to follow picture tracks on tape accurately even on variable speed picture search modes forward and reverse. It was based on mechanical "gearbox", a motor turning a worm gear that in turn rotates miniature nylon gears, which unfortunately now 20… 30 years later crack and split, which make them first noisy and later jamming the DD. This is unfortunate, because without the correct signal from the 2 sensors monitoring gear rotation, the VCR shuts off after 3 seconds and will not run again.

The system described here was developed to replace the head drum tilting system by generating the DD pulses electronically (using a software loaded to Raspberry pi Pico). The pulses are triggered by DD motor supply voltages in FWD and REV terminals in socket CN3501, which is the interface for Dynamic Drum system. As output the generated pulses are fed to VCR processor through MFG and ABS terminals .
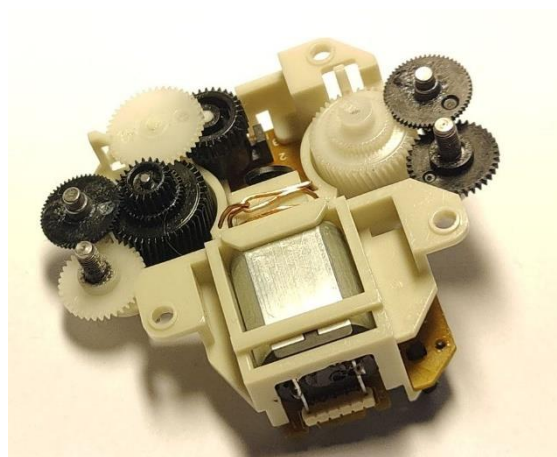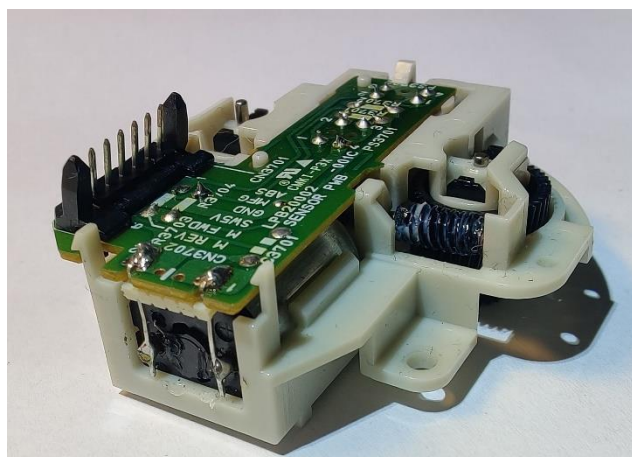

Fig. 1. Dynamic Drum gearbox from JVC HR-S9700. The same gearbox has been used on many other models like HR-S8600. There is also another type of belt driven Dynamic Drum gearbox in some lower end models, but at the moment it is not known (not tested), if the signals are the same and compatible with DD emulator. If the gearbox in your VCR looks like shown in this picture, DD emulator works.
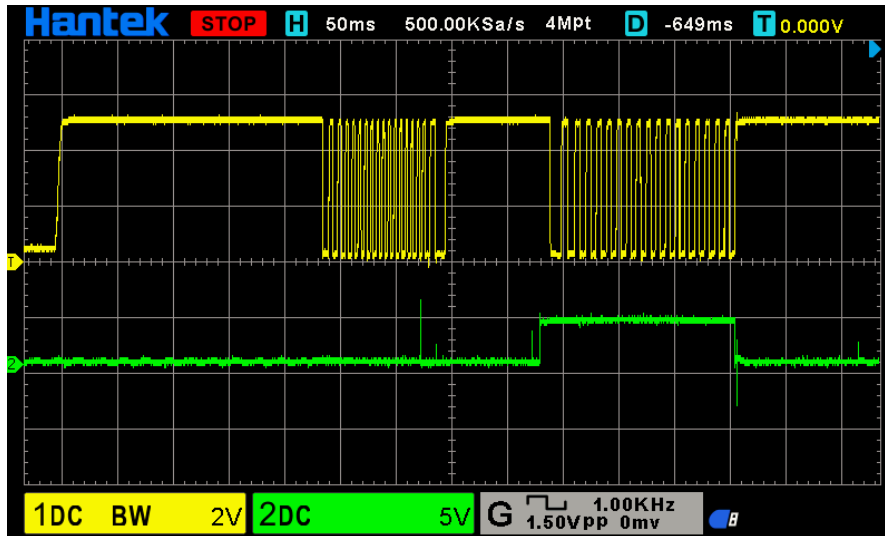
Fig. 2. Example: VCR startup pulses generated by Dynamic Drum system. Yellow pulse on MFG terminal. Green pulse on ABS terminal. Similar pulses, but with variable length depending on picture search mode are generated during operation.

Actual device "DD emulator".

DD emulator consists of printed circuit board (PCB) with Raspberry pi Pico, some resistors, connector for ribbon cable and 2 LEDs.

The 2 LEDs and their ballast resistors are not functionally required, but are only added to visualize the triggering signals on terminals FWD and REV.

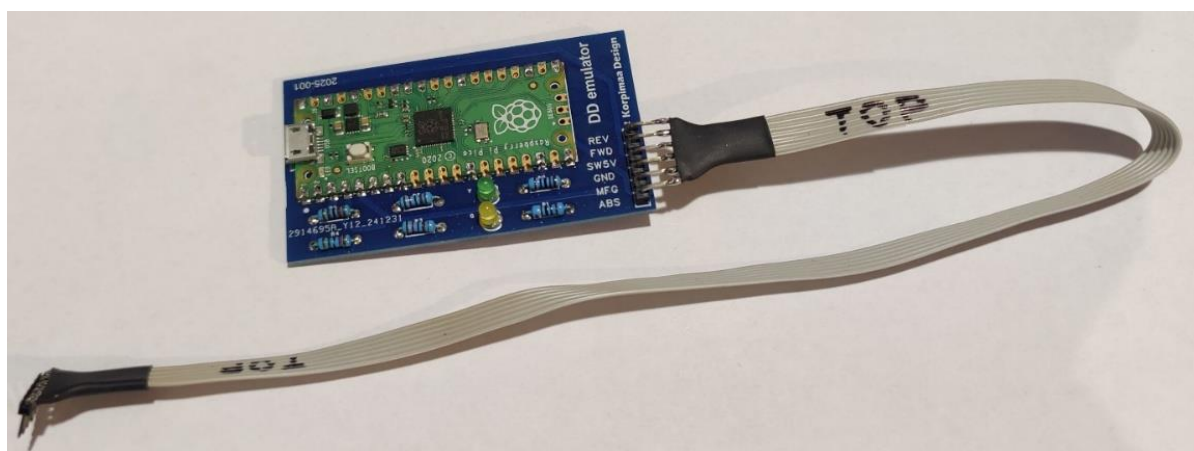The "magic" happens in the software loaded to Raspberry pi Pico.

Fig 3. Actual device **DD emulator** with ribbon cable and connector (6 pins at 2.0mm pitch), that mounts on main board socket CN3501.
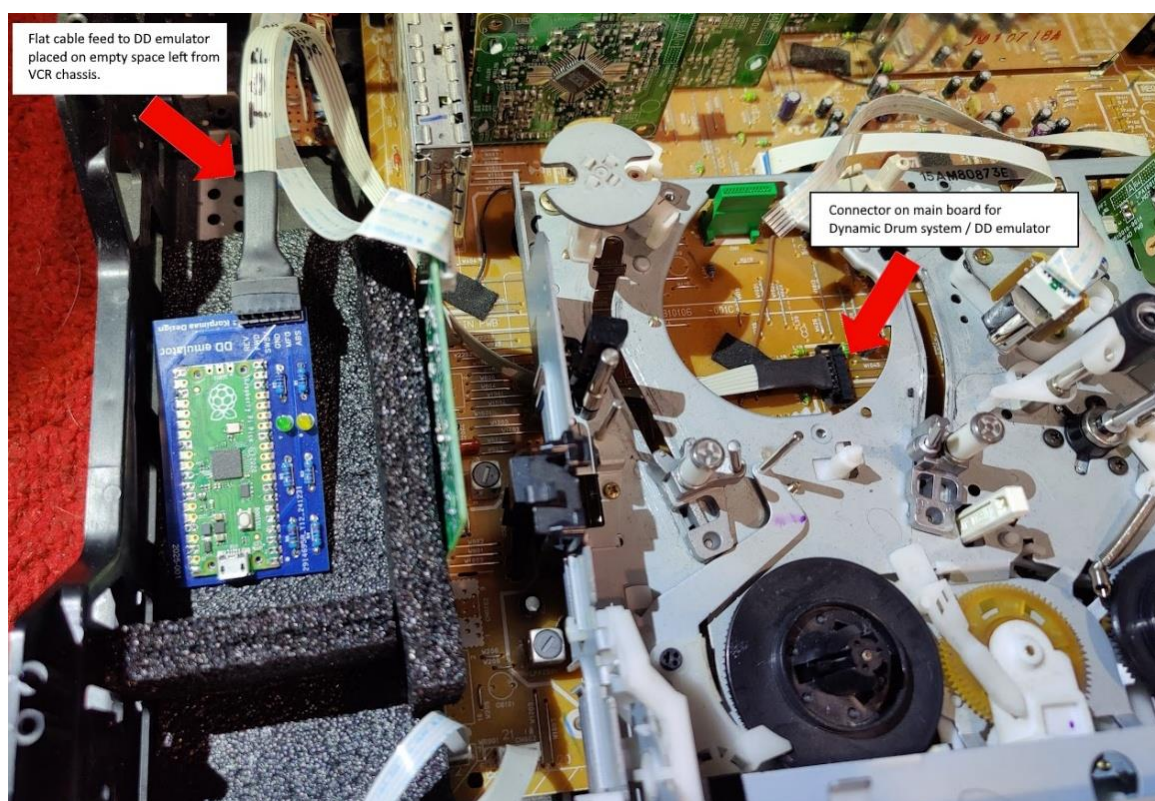
Fig 4. **DD emulator** placement inside VCR, left from the deck. Ribbon connector mounts to socket CN3501 under the video drum, that is removed in this picture.

For mounting the **DD emulator**, unmount the head drum (3 screws & 2 flat cables).

Carefully disconnect the ribbon cables, because they are very sensitive.

Alternatively the Dynamic Drum system can also be accessed from under the deck without removing video drum from the deck, but this requires removing the deck from main board.

If necessary, see instructions in Service Manual of the VCR.

The Dynamic Drum gearbox or at least it's PCB shall be permanently removed from under the head drum to free up socket CN3501. Thereafter the head drum remains stationary in it's neutral position. The ribbon cable from **DD emulator** with 6 pin mail connector shall be connected to socket CN3501 on main board.

On most JVC VCRs there is convenient empty space on left side for placing the **DD emulator**. Use isolation material similar to Fig 4. in order to prevent **DD emulator**s electrics getting contact to surrounding PCBs and metal chassis if not securely fixed.

After installing DD emulator on (JVC HR-S9700) VCR, practice has shown, that the various picture modes on these relative High End VCRs are of reasonably good quality even without Dynamic Drum system:

- Pause / still frame perfect
- FWD / REW search modes have very narrow stripes on SP and little wider noise bars on LP and EP speeds.
- The picture is always very stable due to digital signal handling and TBC.