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Merry Christmas

HOWGOZIT

COVID-19 continues! And while the vaccine is about to become reality, I don't think that there is much out there that scares Myra and me more. We hope that all of you have been taking care and if you are still working and taking care of business for the rest of us, we thank you for your service. We especially appreciate those in the health care profession that are risking their lives daily to provide the best care they can for their patients.

Myra and I are still doing our best to avoid being part of the problem. We shop for essentials once each week to get fresh fruit, milk, eggs, and the like, then return home to shower and change clothes. We wear our masks everywhere we go. The rest of the week we hide at home, call our family, and do the chores. The yard work continues constantly and my newest project has been documenting my garden plants and working on Z-100 projects - this issue includes a new addition to our reasonably priced (Cheap) testing equipment tool box - **The DSO138 Oscilloscope Kit.**

Issue #131 introduced the DL4YHF2 Frequency Counter and Crystal Tester, as an interesting addition to our test bench. However, while testing my new DSO138 Oscilloscope, I found an instability problem with the Frequency Counter. I needed to add a 0.1 uF capacitor to the counter's input to fix the problem. I have uploaded an updated DL4YHF2 manual and this new addition, the DSO138 Oscilloscope, to the Z-100 LifeLine website page, **Inexpensive Test Equipment**. Enjoy.

I also hope that you found the time to review the articles on our IDE Controller NvsRAM battery and reprogramming refresher in the last issue. If you own a LifeLine IDE Controller, you don't want to miss these.

Z-100 Floppy Drive Emulator

I received an email request for a LifeLine IDE Controller Board in October, and after asking for some details, he said he had a Z-100 with his normal 5" drives replaced with two Gotek Floppy Drive Emulators.

He reports using FlashFloppy firmware from https://github.com/keirf/FlashFloppy/ - with the OLED displays and a rotary encoder for selecting images (instead of just the buttons). He has been using these on other machines, including an Amiga, Atari ST, and a TRS-80 Model 4P, since floppies are so unreliable these days.

As all this was new to me, I began researching the web. Here is a summary of the little, and confusing, information I found:

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Floppy Disk Emulators

Unbranded 1.44Mb USB 100-floppy emulator:
Based upon an article on-line by Dr. Gough's TechZone. For the original article, click here:
   https://goughlui.com/2013/04/24/review-unbranded-1-44mb-usb-100-floppy-emulator/

This is a floppy disk emulator which uses a USB stick as the storage media to replace up to 100 1.44Mb 3.5" floppy disks and is useful for transferring files from a PC without modern connectivity.

The Emulator Unit:
This floppy disk emulator features a two-digit 7-segment display on the front panel which displays 00 to 99 for a total of 100 floppies. It also features a Green LED for power and a Red LED for access (Note: The photo shown is not the one being described here), and two push buttons – one to increment the floppy being accessed, another to decrement - and a USB port for storage.

The body of the drive is black plastic, and feels moderately solid with some unthreaded screw holes for mounting if one wishes. The two halves of the case are secured by four screws through the body of the unit. The rear has the regular 34 pin interface, with no shroud, and a provision for a Berg connector for power. Pin 1 of the interface is on the left when viewed from the rear. Internally, it has a single PC board, marked SMUFDDV4@1104.

The board has a few jumper headers available, most of them are unmarked and all are undocumented. Some of them may control drive select A or B. And one seems to be marked "ready", but the remaining purposes are unknown. It looks like the board has a provision for SPI flash mounting at U9, but that was not populated. An ISSI 32kByte CMOS SRAM (IS62C256) chip is likely used as a buffer against USB transfer delays. A 74HC573D Octal D-Type Transparent Latch may be used to latch and drive control signals on the 34 pin interface. The rest of the board is populated by WCH chips, which may make it a WinChipHead product. The chips include:

CH538Q
CH455H – LED drive and keyboard control chip
CH411G

It seems the main chips are not documented in any way.

Use:
Documentation is NOT included, but there are a few intricate details about this particular unit's implementation which would be nice to have documented by the manufacturer, and the jumper settings too.

When there is no USB flash drive key connected, it just displays c4 on the display. Once you insert a key, it will display c5, then c6, and then 00 when it is ready for access, indicating disk 00 is mounted. All disks are writable, and no write protection is available – so a system could always ruin the data on your "virtual" floppies.

Almost any memory stick seems to work, but it should be 256Mb or larger (as 128Mb isn't enough).

Pressing the up/down button allows you to change the active floppy disk from 00 to 99. This cannot be changed while the activity light is on. When using any random USB key which is already formatted, position 00 will appear to be a large floppy disk – the size of the USB key. However, it will NOT function correctly in this mode! You will get erratic read and write errors, so don't expect it to be an easy way to connect a large amount of storage to your older computer in that regard.

However, you can (and should) format the slots you wish to use and read/write to them like you would when using the machine with old fashioned floppy disks. For this, it should work just fine.

This emulator ONLY supports 1.44Mb MFM format. This means that this emulator is suitable for IBM/PC high density (and compatible machines using this format) 3.5" floppy emulation only.

When you plug in a USB flash drive key formatted with this emulator, you will be presented by the OS with a superfloppy key (i.e. partition-table-less) of 1.44Mb. This represents the contents of bank 00. So, it would seem that the data from the disks is converted to its binary image form and stored directly on the USB key without a file system or partition table. The beginning of each disk image is separated by 180000h. At 100 such images, a 256Mb USB drive would be required.

Conclusion:
It's really only suitable for things which read and write high density, 1.44Mb, 3.5" floppies in IBM/PC format. From the article, I could NOT determine if you can use this device as you would a 3.5" drive; using FORMAT, COPY, RENAME, run a file, etc., to each of the 100 slots. I'll update this when I find out.

GoTek SFR1M44-U100K USB 1000 Floppy Disk Emulator:
Based upon an article on-line by Dr. Gough's TechZone. For the original article, click: https://goughlui.com/2013/05/19/review-gotek-system-sfr1m44-u100k-usb-1000-floppy-disk-emulator/

The GoTek System SFR1M44-U100K is a 1000-bank USB floppy disk emulator, attractively priced at around $20.00.

The Unit:
The device itself has the letters GOTEK in the molding, and features a 3-digit 7-segment LED display, a USB port, two push buttons and an access LED. The green LED lights up whenever the drive is active. The right button is used to increment the "ones" position, the left button increments the "tens" position, and pressing both buttons **momentarily** increments the "hundreds" position.

In use, this drive allows you to increment the bank during accesses but this may lead to data loss. The increment function appears to cause the change line to be toggled to signal to the controller a disk removal. The other emulator locks-out the increment/decrement during accesses.

The casing itself differs from the other emulator, with a distinctive "step" shape, and the use of only three screws to secure the unit together. There was also the provision for branding and other button labels which are not provided.

Exposed at the rear are jumpers – some are labeled for drive select, and others are undocumented. There are also through holes unpopulated which are used for firmware programming by jumper. The 34 pin interface has the keying pin (pin 3) still in place; but there is no harm clipping this off for cables with the hole blocked.

The internals consist of a green PCB populated with an STM32F105 ARM Cortex-M3 CPU from STMicroelectronics, a NXP 74HC04D Hex Inverter Buffer, a 3.3v regulator, and a few supporting resistors, capacitors and a crystal. It's a little simpler looking compared to the other emulator – having no external SRAM or multiple ICs – the magic will obviously be in the programming of the ARM CPU.

The unit would display 000 without a USB key connected, and would display the same once a key is connected. Formatting the disks (with verification) with WinImage was not a problem at 1.44Mb. Surprisingly, a format at 1.2Mb also succeeded. 720kB and all non-standard (1.68Mb, 1.72Mb, DMF, 820kB, 360kB, 320kB, 180kB, 160kB) all failed.

Like the first 100-bank unit, this device also stores sector images 180000h apart. The pattern indicates that for 1000 floppies, only the first 1500MiB of any USB key will be used. Therefore, a 2Gb USB key is enough! A smaller key may be used, but the number of partitions is reduced to fit the USB Flash Drive.

The Software:
Some emulators come with an 8cm CD, however, the software tools provided are arranged arbitrarily, are poor and (some) improperly licensed.

It appears there are separate versions for 720kB, 1.2Mb and 1.44Mb formats, and there is a format which images the disk, and another which interprets folders as a disk – and customized versions for sewing machines and networked applications. There is some documentation which refers to a 100-bank model, and others to a 1000-bank model, but all the software tools seem deficient, so it may be best to avoid the CD. A datasheet was provided though with some jumper explanation.

Note: It is reported that Ipcas has a similar floppy emulator and had software downloads. Curiously, their software download is similar to the software provided with this GoTek system unit – but does NOT appear to work.

There are two programs supplied – one of them is called UFDISKManager.exe and is supposed to allow you to access each of the disks on your USB key by extracting the files into a temporary directory, where you can modify them, and then repack them back and write them to the USB key. Unfortunately, the language seems permanently fixed to Chinese.

When bank 001 is formatted as a 1.2Mb floppy, it is detected correctly. It does not change the binary offset for the other banks however, but this format does NOT work properly. When an attempt is made to read a disk which is formatted as a 1.2Mb bank, the unit emits the full 18-sectors per track at 300rpm – not the expected 15 sectors per track at 360rpm. This makes the unit unsuitable for emulating 5.25" HD drives – only good for 1.44Mb HD 3.5"!

The other piece of software is UFloppyManager.exe with a plethora of options related to pre-formatting a USB key for use with the drive, but it does NOT seem to work meaningfully either. So it's pretty much a fail all round with the software.

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How to Select the Right Model:

The GOTEK Series of Floppy Emulators services a wide range of applications, from computers to sewing machines, music keyboards to embroidery machines, CNC machines and others. Here are the primary considerations:

1. Model of emulator:
    With 1.44MB capacity disk and 34pin floppy driver interface:
        SFR1M44-FU
        SFR1M44-FU-DL
        SFR1M44-FUM-DL
        SFR1M44-FEL-DL
        SFR1M44-LUN
        SFR1M44-U100K
        SFR1M44-TU100K

    With 720KB capacity disk and 34pin floppy driver interface:
        SFRM72-FU
        SFRM72-FU-EG
        SFRM72-FU-DL
        SFRM72-TU100K

    With 26pin flat cable floppy driver interface:
        SFR1M44-DU26
        SFRM72-DU26
        SFR1M44-TU26

2. What is the interface of floppy driver:
        IDC34 pin+4P power plug
        IDC26 pin without additional power
        FPC26 flat cable 1.0MM pin distance
            use model SFR***-**26
        FPC26 flat cable 1.25MM pin distance
        IDC34 pin without additional power

3. What is the capacity of disk:
        1.44MB Use model SFR1M44-***
        1.2MB   Use model SFR1M2-***
        720Kb   Use model SFRM72-***

4. Is the format of disk FAT:
    Open the flash drive on a computer,
    to confirm if the format of disk is FAT.

Conclusion:
The 3", 1.44Mb Gotek works as advertised, with drawbacks. The popularity of the Gotek and similar floppy emulators has driven firmware, hardware, and software upgrades that make this an excellent choice for finally breaking the bonds to the unreliable, and increasingly hard to find, floppy disks. Success has also meant that the Gotek floppy emulator is now also available for other common floppy disk formats, 1.2Mb and 720Kb.

Use in the Z-100 Computer:
The Gotek Floppy Emulator sounds like just the ticket for those who desire solid-state booting capability from nonvolatile RAM without the expense of an IDE Controller Board. This sounds like it would work just as well as an IDE hard drive, and with 1000 1.44Mb partitions, there would still be plenty of storage. The only disadvantage is the limited storage of one floppy, when compared to the much larger IDE hard drive partitions. But who really needs several megabyte partitions when using the Z-100?

Another advantage to the USB drive is the capability of transferring files between a Z-100 and a PC.

The only thing really missing when compared to an IDE Controller Board would be the real-time clock capability. But with my new, inexpensive ZCLK2 clock board, this could easily be remedied.

It would be nice to have an emulator to replace the lowly, but commonly used, 5" Floppy. But when you think about it, who would really want to be limited to 360Kb partitions? One file could exceed that limitation. I think they would be of very limited capability and functionality, even for the Z-100.

For those using the newest Monitor ROM (ZROM v4), and the latest ZDOS v4, and using a Z-207 Floppy Controller with the Barfield Mod, using the 3" Gotek emulator should be a piece of cake.

I have updated the Gotek User's Manual that came with my Gotek, included my comprehensive testing information and have attached it as an enclosure. One of the advantages of publishing on-line is that I can update the articles with new information, as it becomes available. Expect to see a future article on the Gotek Floppy Emulator as I explore its capabilities further.

Closing

We wish you and your families all the best for the holidays and into the New Year. Keep your families safe and get vaccinated as soon as you can.

'Til next time,
happy computing!

Cheers!!!

Z-100 LIFELINE
Supporting the H/Z-100 Community Since 1989

Steven W. Vagts
211 Sean Way
Hendersonville, NC 28792
(828) 685-8924
e-mail:z100lifeline@swvagts.com

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