vMap^{QL}

The QL Microdrive Address Translator

First Edition 2017
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Document History

19/08/17    version 1.00     initial draft
24/08/17    version 1.02     updated map table
26/08/17    version 1.08     added QL notes
06/09/17    version 1.09     first release
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The vMap^{QL} …

The vMap^{QL} is a configurable hardware device which translates Microdrive addresses for the QL. The vMap^{QL} can flexibly map both internal and external Microdrives to a wide range of address combinations allowing, for example, external Microdrives to appear as `mdv1` or `mdv2`.

This Manual…

Provides you with everything you need to make full use of the vMap^{QL}

If you have yet to install the vMap^{QL} in your QL then please follow the instructions that came separately.

The manual is organised in the following chapters:

Please read this manual in conjunction with the original documentation that came with your QL computer system, as topics that have been previously introduced, such as file management and Microdrive commands, will not be covered in detail here.

Introduction

The vMap^{QL} is a configurable hardware device which translates Microdrive addresses for the QL. The vMap^{QL} can flexibly map both internal and external Microdrives to a wide range of address combinations allowing, for example, external Microdrives to appear as mdv1 or mdv2.

It is powered by the Microdrive interface and, apart from a relatively simple installation procedure, requires no changes to the QL hardware. The device is programmed by either a small standalone utility or by the toolkit than comes as standard with its companion device, the Microdrive hardware emulator, the vDrive^{QL}.

To load the vMap^{QL} standalone utility copy the `boot` and `vmapql_bin` files provided onto a spare cartridge and load into `mdv1`. Either reboot the QL or `LRUN mdv1_boot` to install. The commands will now be available and will stay resident. For instructions on loading the full vDrive^{QL} toolkit please see the vDrive^{QL} user manual.

Configuration changes are stored in non-volatile memory and are recalled whenever the QL is turned on. Any changes, including the current configuration at power-up, are also passed to the vDrive^{QL} (if attached).

The vMap^{QL} can be used on its own (with some restrictions – see Chapter 2, ***Configuring the vMap^{QL}***) or with the vDrive^{QL} to fully realise its flexibility.

Configuring the vMap^{QL}

The vMap^{QL} is programmed by the VMAP command with a single digit parameter (configurations are stored in non-volatile memory).

Available options:

VMAP	Microdrive Address							
	mdv1	mdv2	mdv3	mdv4	mdv5	mdv6	mdv7	mdv8
0	INT2	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	EXT7
1	INT1	INT2	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6
2	EXT1	INT1	INT2	EXT2	EXT3	EXT4	EXT5	EXT6
3	EXT1	EXT2	INT1	INT2	EXT3	EXT4	EXT5	EXT6
4	EXT1	EXT2	EXT3	INT1	INT2	EXT4	EXT5	EXT6
5	EXT1	EXT2	EXT3	EXT4	INT1	INT2	EXT5	EXT6
6	EXT1	EXT2	EXT3	EXT4	EXT5	INT1	INT2	EXT6
7	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	INT1	INT2
8	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	EXT7	INT1
9	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	EXT7	EXT8

	Internal Microdrive # 1
	Internal Microdrive # 2
	External Microdrive
	Only possible with vDrive

Unfortunately the available mappings without the vDrive^{QL} are more limited as there is no external logic to prevent address clashes with internal drives (for example – for VMAP 2 only one external Microdrive can be usefully attached, the others being greyed out).

The vMap^{QL} is designed to prevent these clashes and if Microdrives are attached, that would cause problems, then they are simply not addressed. The vDrive^{QL} overcomes this limitation with all eight addresses being available for all mappings (see QL issues in note 2 below).

To provide added flexibility the VSWAP and VSTD commands are also provided. The VSWAP command swaps redirects all accesses for internal drive #1 to internal drive #2 and vice versa. The VSTD command restores the internal drive addressing to normal. VSWAP can be used for all VMAP configurations.

If a vDrive^{QL} is attached then the List vDrives (LV) command will display the current remapped drive assignments including swapped internal drives.

When any of the vMap^{QL} commands are executed, confirmation is provided either by the internal drive #1 access LED briefly flashing (if the vMap^{QL} is used by itself) or the by the vDrive^{QL} access LED flashing red.

Notes:

1. Due to way the QL keeps track of cartridges, the QL can lose its way when Microdrive assignments are changed on the fly. For this reason, it is recommended (but not mandatory) that once a configuration is selected that the QL is rebooted. More times than not it won't matter but when it does, will appear that the vMap^{QL} is not working correctly.
2. The useable number of drives is limited in some cases due to a bug in the JM and JS ROM where any access to drive #7 will prevent drive #1 from subsequently working. As well, any access to drive #8 will stop drive #2 from working correctly. The Minerva ROM corrects this bug.

Some examples:

Note: Without a vDrive^{QL} connected, greyed out external Microdrives addresses will be unavailable.

VMAP 1 - the standard configuration:

VMAP	mdv1	mdv2	mdv3	mdv4	mdv5	mdv6	mdv7	mdv8
1	INT1	INT2	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6

The internal Microdrives are addressed as mdv1 and mdv2 with up to 6 additional Microdrives available.

VMAP 2:

VMAP	mdv1	mdv2	mdv3	mdv4	mdv5	mdv6	mdv7	mdv8
2	EXT1	INT1	INT2	EXT2	EXT3	EXT4	EXT5	EXT6

The first external Microdrive is addressed as mdv1, internal Microdrive #1 is addressed as mdv2 and internal Microdrive #2 is addressed as mdv3.

VMAP 2 + VSWAP:

VMAP	mdv1	mdv2	mdv3	mdv4	mdv5	mdv6	mdv7	mdv8
2	EXT1	INT2	INT1	EXT2	EXT3	EXT4	EXT5	EXT6

This is same as for VMAP 2 but the addresses for the internal Microdrives are swapped. The VSTD command will restore the internal Microdrives addresses to the normal order.

VMAP 9:

VMAP	mdv1	mdv2	mdv3	mdv4	mdv5	mdv6	mdv7	mdv8
9	EXT1	EXT2	EXT3	EXT4	EXT5	EXT6	EXT7	EXT8

The internal Microdrives are not addressed leaving all 8 external Microdrive addresses available.

The vMap^{QL} Command Reference

`VMAP` n	Sets address remapping to configuration n where n is a number from 0 to 9 (see *Chapter 2, **Configuring the vMap^{QL}***)
`VSWAP`	Redirects all accesses for internal drive #1 to internal drive #2 and vice versa. `VSWAP` can be used for all `VMAP` configurations.
`VSTD`	Restores the internal drive addressing to normal.

Under the Hood

For address decoding, each Microdrive has built into its logic the equivalent of a single shift register stage with an input, and an output which changes to the input state when a clock pulse is received. When several Microdrives are connected together then the output of this single bit shift register is connected to the input of the next creating a chain.

Every time a Microdrive is addressed, a single data bit (logic level '1') is clocked through each connected Microdrive using the common clock. Subsequent data bits are logic level '0'. The number of clocks determines 'how far' the '1' data bit travels through the connected Microdrives.

When the clock stops, the Microdrive which has the '1' currently at the output of its shift register will be enabled. As this same output is configured to turn on the power to the Microdrive motor then the addressed Microdrive starts up and the LED lights. Turning off all Microdrives is done simply by clocking a '0' for 8 bits. This sets all the connected Microdrive shift register outputs to '0' and all motors (and LEDs) are turned off.

The vMap^{QL} connects to the QL Microdrive data and clock lines and decodes the Microdrive addresses on the fly. Dependent on the configuration, the vMap^{QL} then recreates the data and clock lines for the internal and external drives allowing address translation to occur.

Hardware

The vMap^{QL} uses a ATTiny25 microcontroller operating at 8MHz with 2K bytes of flash memory, 128 bytes of fast static ram, and 128 bytes of non-volatile EEPROM storage. Control lines to the QL are buffered with series resistors to protect the ZX8302 ULA.

Development

The vDrive^{QL} has been developed with the following tools:

AVR C Compiler   CodeVisionAVR by HP InfoTech

AVR IDE   AVR Studio 7 by Atmel

68000 Assembler   QL-Macro Assembler by GST Computer Systems

QL Emulator   Q-emulator by Daniele Terdina

Schematic and PCB DesignSpark PCB by RS Components Ltd.

3D Modelling   DesignSpark Mechanical by the SpaceClaim Corporation

Supported Systems

As well as the standard 128K QL hardware with either the JM, JS or Minerva 1.98 ROM, the vMap^{QL} has also been tested on the following:

Miracle Systems Gold Card

Miracle Systems Super Gold Card

512K memory expansion cards

QL Trump Card (including clones)

vDrive^{QL}

Any combination of system firmware and peripheral listed above are supported. It is likely that many other peripheral cards will also be compatible but these haven't been tested.