Ser-USB 2.0 Drivers User Manual

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v2.00b, 13th February, 2012

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Important Notice For Standard QL Users

PLEASE READ THIS FIRST

Although the Ser-USB 2.0 Legacy Driver is useable on a standard QL, it is not possible to guarantee its performance and stability in that environment for every configuration.

In order to create a workable driver it has been necessary to work around some parts of the operating system when the driver is loaded. Tests have shown that, in most cases, this does not result in any loss of stability of the QL but, as a result, not all software will work with the Ser-USB driver running on legacy hardware.

Some configurations exhibit problems with the 2.0 legacy driver that may not manifest on other systems. The reasons for this are many and complex. Despite hundreds of hours having been spent trying to fix these issues it has not been possible to solve all of them. Therefore you should thoroughly test the 2.0 drivers with your system first, before committing valuable data to their care.

The Ser-USB Legacy Driver requires a minimum of 256K expansion memory.

The standard QL serial ports are limited to a maximum speed of 4800 baud when used with a Ser-USB.

The Ser-USB driver is a complex piece of software that makes it possible to connect 21st century storage devices to a 1980s microcomputer. It does this by using the simple serial hardware present on the QL and by invoking, where possible, only the documented features of its operating system.

Although the original QL serial ports are barely adequate for this task, they **will** support the Ser-USB if the consequent performance limitations are accepted.

If you do not have expansion memory you may still be able to use the Ser-USB with SD Cards and USB Drives formatted in FAT16 or FAT32 format using the alternative Ser-USB FAT Driver.

If at all possible you should acquire a Hermes, superHermes or other enhanced serial port hardware to use the Ser-USB with a standard QL.

If you are not in a position to upgrade the serial hardware on your QL we strongly recommend that you use the FAT Driver on your system. In FAT mode, filing system management happens on the Ser-USB and all I/O transactions are initiated from user mode, resulting in more reliable performance over slow serial ports.

If your hardware can handle it, consider installing SMSQ; this has better serial I/O handling, as well as other features that the driver can take advantage of.

QUICK START

FIRST: Make sure that the Ser-USB is connected to its power supply and that the power supply is plugged into an active power socket. Connect the serial lead from the Ser-USB to the QL or PC/Mac. Insert an SD Card in the Ser-USB. Switch on or reset the QL (or load the QL emulator on your PC/Mac). Wait until the tweed pattern appears on the QL screen (or the emulator has started) then push the reset button on the Ser-USB.

Now use this quick start guide to get the Ser-USB Native Driver up and running on your system so that you can try it out before configuring the driver ...

SELect ON What machine you are using

= "Black Box" QL with standard serial ports **:**

LRESPR serusb2L_RAM_bin

WITHIN 1.5 SECONDS **IF** Connecting on SER2 **THEN**

PRESS [F5]

TYPE_IN 4802[ENTER]

END IF

= "Black Box" QL with a Hermes chip or superHermes using SER1/SER2 **:**

LRESPR serusb2L_RAM_bin

WITHIN 1.5 SECONDS **PRESS** [F5]

SELect ON Connecting Port

=SER1: **TYPE_IN** 19200[ENTER]

=SER2: **TYPE_IN** 19202[ENTER]

END SELect

= "Black Box" QL with a superHermes board using SER3 **:**

LRESPR ipcexts_bin : **LRESPR** serusb2L_RAM_bin

WITHIN 1.5 SECONDS **PRESS** [F5]

TYPE_IN 57603[ENTER]

= Q40 or Q60 or other QL compatible hardware not listed above **:**

LRESPR serusb2L_RAM_bin

WITHIN 1.5 SECONDS **PRESS** [F5]

TYPE_IN *Baud Rate+Port Number* [ENTER]

= QL Emulator running on PC, Mac or Linux system **:**

LRESPR serusb2_bin

END SELect

WHEN Everything is OK **OR** Nothing Works

ReadTheManual : **REMark** Especially the section "Configuring the Driver"

END WHEN

Note: If you have the ROM version of the Native Driver it should already be configured for the port that you specified when you ordered it. If not, when the message: "Press any key in 1.5s to abort load" appears on the startup screen, hit the [ESC] key and then either F1 or F2 to start the QL. Then type the command SRU_START *Baud Rate*+*Port Number*.

Introduction

This is the second edition of the user manual for the *Ser-USB* Serial USB Device for Sinclair QLs, compatibles and QL emulators running on PCs, Macs and Linux systems. It replaces all previous manuals and documentation for add-ons and utilities.

What is the Ser-USB?

The Ser-USB is a device that attaches to one of the QL serial ports and provides access to storage devices such as SD cards, memory sticks and USB hard drives. It consists of an OEM USBWiz I/O module with some extra circuitry to translate RS232 levels to and from TTL, and to drive a pair of indicator LEDs. Now at end of life, the Ser-USB was sold by Memory Lane Computing from the 8th of May, 2011 to the 12th of February, 2012. Although the Ser-USB is no longer produced, these drivers can still be used with any hardware that connects a USBWiz module to one of the serial ports.

Illustration 1: The Ser-USB Unit

The Ser-USB requires an external 5V power supply and a suitable serial lead. Both of these are provided.

The primary use of the Ser-USB is as a portable device for moving files between machines using modern, readily available, storage devices.

Ser-USB can also be used with QLs, QL clones and QL emulators that are running on PCs and Macs with serial ports.

There are two “modes” for using the Ser-USB, for which separate drivers are provided:

Native

For using SD Cards and USB storage devices formatted as QDOS volumes. This comes in two flavours: *Legacy* for Black Box standard QLs and compatibles, and *Destiny* for QL emulators).

FAT

For using FAT16/FAT32 SD Cards and USB storage devices. The FAT driver does not mount the volume as an accessible device but instead provides access to the drives through S*BASIC extensions for copying, deleting, renaming files etc.

Unusually for a device driver, because it does not need any QL-specific hardware, the drivers will run under QL emulators, as long as they have access to suitable serial ports.

What Ser-USB is not!

It is not intended to be a replacement for a permanent fixed disk. Even with the fastest serial ports it cannot deliver the performance necessary to equal that of a hard disk connected through the QL's expansion connector (such as, say, a QUBIDE interface).

It does not support the connection of USB devices that are not "mass storage" class (such as mice, keyboards etc).

It is not a high speed device. On a standard QL without enhancements, the Ser-USB is limited to running at 4800 baud. Whilst this works, it is very slow. Much slower than floppy disk access.

What configuration will get the best out of Ser-USB?

For best possible performance on QL hardware use the Ser-USB with a Super Gold Card, superHermes and the latest version of SMSQ. With this configuration 57600 baud is reliable, with 115 Kbaud possible in some circumstances (depending on hardware and software load).

Remember: The faster the serial port the better the performance.

The fastest possible performance will be obtained when using the Destiny Driver and a QL emulator running on a PC, Mac or Linux system. Speeds up to 230 Kbaud are then perfectly possible.

Getting Started

Preparation

You will need:

- The Ser-USB Module
- The 5V Power Supply
- A lead to connect the QL serial port to the Ser-USB
- The Ser-USB software (on CD ROM, download or ROM)
- A suitable storage device (SD card, memory stick or USB hard drive)
- If you need to configure the driver for your environment you will need the latest version of Jochen Merz's MenuConfig program.

Procedure

Connect the power supply to the Ser-USB. The connection is made via a 2.1mm coaxial power socket on the side of the unit. At this point, it is not important whether the power supply is on or off.

Connect the Ser-USB to the QL with the serial lead. On a standard QL make sure that you connect to the correct port for the supplied serial lead; they are not interchangeable due to the wiring of the QL's serial ports.

If you have superHermes then connect to the fast serial port. On a PC, Mac or Linux system running a QL emulator you can use any serial port or USB to serial adapter that the emulator recognises (but make sure that you know which SER port this corresponds to within the emulator before starting).

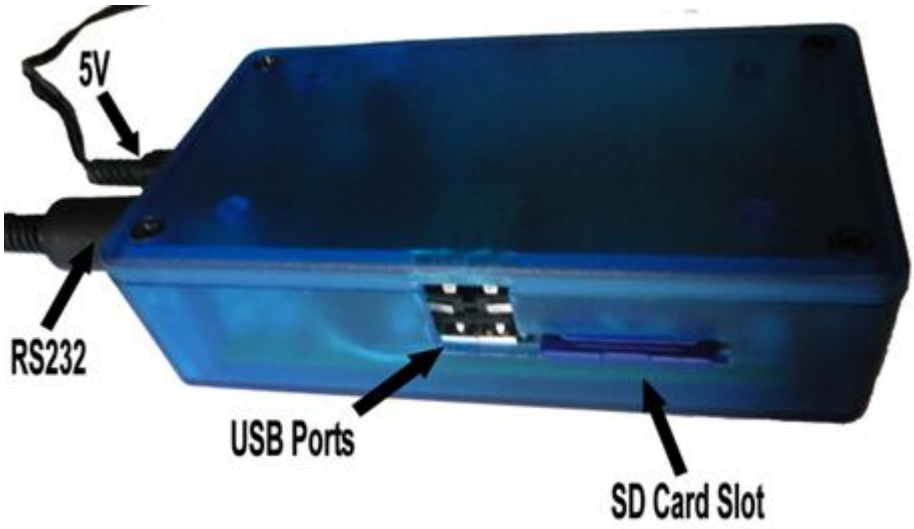


Illustration 2: The Ser-USB Connections

Either insert an SD card in the slot or connect a memory stick or hard drive to one of the USB ports.

The narrow horizontal slot in the case lines up with SD Card socket on the USBWiz module inside the Ser-USB. The card must be inserted with its label facing upwards and the sloping corner on the side facing away from you . Push gently to latch it in place; push gently again to unlatch it when you want to remove it.

Illustration 3: Inserting the SD Card (old model Ser-USB)

Note: Earlier models of the Ser-USB had a single L-shaped cutout on the front which exposed the whole socket assembly (as seen here) making it appear as though there were actually two sockets, one on top of the other. If you have one of these early units then it is vital that you only try to insert the card in the “top” half of the slot, as the “bottom” half is a void which serves to raise the socket off the PCB.

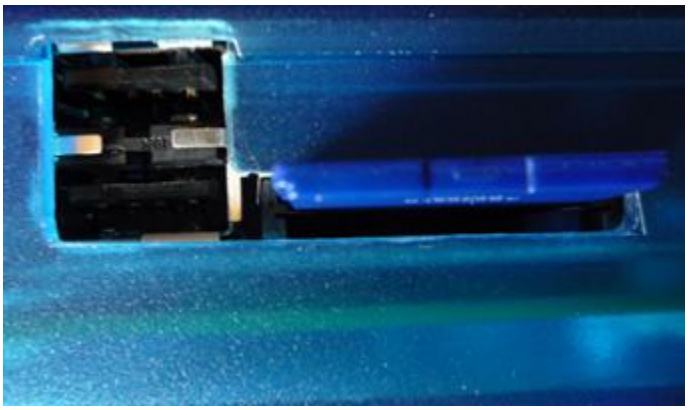


Illustration 4: Inserting the SD Card (old model Ser-USB)

By default, the Ser-USB driver will attempt to mount an inserted SD card as SRU1. If you are not using an SD card you can configure the Ser-USB driver to mount a drive attached to either of the USB ports as SRU1 instead. Use MenuConfig for this before you start. (see the section “Configuring the driver”)

It is usually a good idea to reset the QL, then briefly press the reset button on the Ser-USB before proceeding. If you are using an emulator it is also a good idea to reset the Ser-USB before loading the driver.

Loading the Legacy Driver on QL Hardware

Load the driver with a Toolkit 2 command such as:

```
LRESPR flp1_serusb2L_RAM_bin
```

Or, without Toolkit 2:

```
a= RESPR(17000)
LBYTES flp1_serusb2L_RAM_bin,a
CALL a
```

A short message will be displayed giving information about the driver.

```
Ser-USB Legacy Driver vN.NN.NNN by Memory Lane Computing, 2012
```

Loading the Destiny Driver with QL Emulators

If you are using a QL emulator such as QPC2 or Q-emuLator, running on a PC, Mac or Linux system, then you should load the alternative Destiny Driver:

```
LRESPR flp1_serusb2_bin
```

or

```
a= RESPR(16300)
LBYTES flp1_serusb2_bin,a
CALL a
```

A short message will be displayed giving information about the driver.

```
Ser-USB Destiny Driver vN.NN.NNN by Memory Lane Computing, 2012
```

Note: The version number is made up of three components separated by periods:

Major Version . Minor Version . EDDE Build

The suffix L is appended for the Legacy Driver.

After this message there will be a brief pause, during which time you can press one of the following keys to change the start-up behaviour of the driver:

[ESC]

Prevent the driver from mounting SRU1.

[F4]

Signal to the driver that the USBWiz is already set to the baud rate for which the driver has been configured. This is useful if you had previously loaded the driver and the baud rate had already been set and, for some reason, you have had to reboot the QL. In this case pressing F4 will bypass the attempt to set the Ser-USB's baud rate.

[F5]

Displays the prompt:

```
F5 pressed. Enter config string:
```

at which point you can enter a long integer value consisting of baud rate + serial port number (see the SRU_START command for more details).

After pressing any of these keys a message is displayed confirming that the keypress has been recognised and will be acted upon. You have about 1.5 seconds after this message to press another of the listed keys to invoke their special function as well.

Note that [F4] and [F5] cancel each other out. You cannot use [F4] to tell the driver that the Ser-USB is already set to the baud rate that you specify using [F5], only that the Ser-USB is already set to the driver's *configured* baud rate, as per its Config Block.

The driver will attempt to communicate with the Ser-USB on the configured port and baud rate. During this process, the following messages (or similar) will be displayed:

```
Connecting to Ser-USB on: SERn ...
Setting the configured baud rate ...
Connected to a USBWiz vN.NN device on SERn at NNNN baud
```

Note: On a standard QL without superHermes, you are limited to 4800 baud. It ought to be possible to use 9600 baud but, unfortunately, the QL hardware requires an additional stop bit at this speed that the USBWiz module does not provide. (superHermes should work OK at any baud rate up to 57600).

At 4800 baud two “Connecting to Ser-USB on …” messages will be displayed; the first a brute force attempt to set 4800, the second the actual connection attempt at the lower rate.

If the connection was established successfully, the next step will depend upon how the driver has been configured.

If the driver has not been configured to mount a drive for SRU1 (see the section *Configuring the Driver*), or you pressed [ESC] when the information banner was displayed, then the initialisation process is finished. If you subsequently wish to mount a drive you must manually issue a **MOUNT** command.

Otherwise, the driver will try and mount SRU1. This involves loading and checking the FAT and may take some time, especially on slow serial connections.

While this is happening you will see the following message:

```
Loading and checking FAT ...
```

… followed by OK if the drive was mounted successfully or, if this is the first time that you have used the drive with Ser-USB, the message:

```
Drive 0 not found!
```

… in which case you will need to FORMAT the drive. See the section “How to FORMAT the drive” for the full details of this procedure.

Once this process is complete you are ready to access SRU1 just like any other QL device.

Limitations and Restrictions

Although the Ser-USB appears like any normal QL directory device it is important to understand that, behind the scenes, all input and output is taking place over the serial port. It will be obvious that the serial port to which you have connected the Ser-USB cannot be used for anything else, but there are some other limitations imposed by the architecture of QDOS.

The most important limitation is that the Ser-USB driver can only do one thing at a time. If an application program performs repeated filing system operations in quick succession on a Ser-USB device then it will either be stalled or may lock up altogether. There are ways to mitigate this but it requires that special consideration is given to the Ser-USB in the coding of the application. Tools are available from Memory Lane Computing to help developers who wish to develop Ser-USB friendly applications and some programs (such as the Q-Trans File Manager by Dilwyn Jones) have already been patched in this way.

Please remember that the Ser-USB is not intended to be a fixed disk replacement. It is recommended to avoid having data-intensive applications use the Ser-USB for storage.

Supplied Software

These are the files that are provided with the Ser-USB, either on the CD ROM, or in the downloadable ZIP file. Please remember to configure the file to match your setup before loading. Use the freely available MenuConfig program for this.

readme_txt

This file contains information that did not make it into the manual and any other details that are specific to the software release that it accompanies.

SERUSB2_bin

This is the Destiny Driver for QL emulators running on PCs, Macs and Linux systems. Do not try to load this on a standard QL; it will not work. This comes configured for SER1 at 115200 baud.

SERUSB2L_RAM_bin

This is the LRESPR version of the Legacy Driver for QL and compatible hardware. This comes configured for SER1 at 4800 baud.

SERUSB2L_ROM_bin

This is the ROM image of the Legacy Driver for QL and compatible hardware. It is ready to be burned into a 16K EPROM and comes configured for SER1 at 4800 baud.

USBWIZ_RAM_bin

This is the LRESPR version of the FAT Driver for all platforms. This comes configured for SER1 at 4800 baud.

USBWIZ_ROM_bin

This is the ROM image of the FAT Driver for QL and compatible hardware. It is configured for SER1 at 4800 baud.

EDDE2_bin

The EDDE 2 Link Layer Driver. This implements a device called EDDE which allows application programs to communicate with any EDDE driver currently installed on the system. It must be loaded before running the Partition Manager.

pm_exe

The EDDE Partition Manager used for partitioning and formatting drives. This program is capable of partitioning any drive that can be accessed by an EDDE driver, but it requires that the EDDE 2 Link Layer Driver be loaded first in order to do so.

uwt_exe

A simple serial terminal and file transfer utility for experimenting with the Ser-USB. It can also be used to obtain additional data and to perform tests when trying to debug problems with your setup.

uzx_bin

This is a special extension for use with the FAT Driver that adds two additional commands (UZX and UZXW) for executing files directly from a FAT drive. These are more compatible than the built in UZ_EX and UZ_EW commands.

wins_bin

An extension that contains commands for setting the three S*BASIC windows to one of four pre-defined settings. It also includes the command SRU_WINS, which can be used after booting with the Ser-USB Legacy ROM to adjust the QDOS and S*BASIC channel tables so that they are the same as a normal start. (See the sections *The WINS Extension* and *Native ROM Driver Issues* for more details).

How to Partition the Drive

Overview

Before any storage device attached to the Ser-USB can be used directly in QDOS or SMSQ it must be partitioned and formatted. Partitioning is the process of allocating the available physical storage space on the drive to logical partitions that can then be mounted as the drives SRU1 to SRU8.

The partitioning scheme used by Ser-USB is the same as that adopted by the last version of the QUBIDE driver: a maximum of 32 partitions is possible on any physical drive. Note, however, that QDOS/SMSQ can only "see" eight of these at any one time.

There are two ways to partition a drive with Ser-USB:

1. Use the FORMAT (or SRU_FORMAT) command to initialise the drive and create partition #1. This may be all that you need to do if you do not have a use for the additional storage space on the drive. This is discussed in the next section: "How to FORMAT the Drive".
2. Use the Ser-USB Partition Manager (PM) to initialise the drive and create as many partitions as you need (up to 32)

Because of the performance problems of loading and saving a large map over the Ser-USB's serial connection it probably makes sense to keep partitions small and mount more of them, rather than creating one or two large partitions.

It's worth mentioning at this stage that the Partition Manager displays a lot of information about Heads, Tracks and Cylinders, but these values are, in fact, pure fantasy. Ser-USB emulates the geometry of a physical hard drive for compatibility purposes (even when it's connected to a real hard drive!). The only thing that matters to Ser-USB is the LBA (the Logical Block Address) a 32 bit number that is the unique address of each 512 byte block on the storage medium. And just to confuse matters, these blocks are not the same as the blocks that are used in the filing system. *Those* blocks are called *Groups* by Ser-USB as they represent groups of 2,4,8 or more 512 byte blocks and are the smallest unit of space that the filing system allocates.

Whilst the preceding information may be interesting (or not), the Partition Manager does not require you to use blocks, sectors, cylinders or tracks. Most of the time you can just say "I want an N Megabyte partition" and the Partition Manager will do all the calculations for you.

Note: The Ser-USB FORMAT/SRU_FORMAT commands create partitions of exactly the size in Megabytes that you request, whereas the Ser-USB Partition Manager will always try and round up the size of the partition to completely occupy a fixed number of frames.

If you are wondering what a "frame" is, it is the term used by Ser-USB to describe the space allocated to an emulated hard disk cylinder. There are no "real" cylinders in the Ser-USB world, because all drives are addressed with the Logical Block Addressing scheme, but the use of frames (emulated cylinders) enables partition structures to remain compatible with other QL hard disk drivers, at the cost of some wasted space. In Ser-USB, one frame is 1008 LBAs (516096 bytes, or 504K).

The FORMAT/SRU_FORMAT commands calculate the size of the partition in LBAs with the formula:

```
SizeMBs * 2048
```

The Partition Manager calculates the size of the partition in complete frames with this formula:

$$INT\left(\frac{SizeMBs * 1024 * 1024}{516096}\right) + 1$$

Thus, for a 5MB partition, FORMAT arrives at a size of 10240 LBAs = 5MB. The Partition Manager, however, creates a partition of 11 frames = 11088 LBAs = 5.414MB. As partitions must start on frame boundaries, the FORMAT command results in 848 unused LBAs between the end of the partition and the start of the next.

Clearly, then, the best way to allocate space on the drive is to use the Partition Manager. However, given the enormous size of today's storage devices and the paltry amount of space required by most QL applications such wastefulness is not really a critical issue.

The Ser-USB Partition Manager

This program is written in TURBO'd S*BASIC, and uses the EDDE 2 API to manipulate drive data structures. It requires that the EDDE 2 Link Layer Driver (EDDE2_bin) is loaded.

To start the program EXEC the file pm_exe. (If you don't have the Pointer Environment loaded you will have to EXEC_W because PM does not have a cursor most of the time.)

You will see a screen something like this:

Illustration 5: The PM start-up screen

Make sure that there is at least one device attached to the Ser-USB (an SD card or USB hard drive/memory stick) and press [F3]. The main screen will clear and the menu bar along the bottom of the screen will show the available commands:

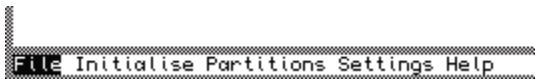


Illustration 6: PM Main Menu

You can select a menu option either by pressing the letter that is shown capitalised in the name (usually the first), or use the [LEFT] and [RIGHT] keys to move along the list, then hit [ENTER] to choose.

To initialise a new drive that has not previously been used with Ser-USB, choose the Initialise option. The screen will now look like this:

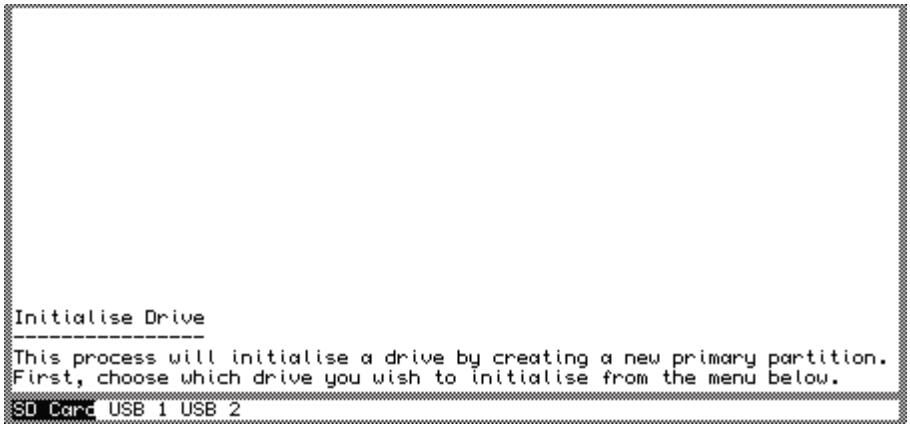


Illustration 7: PM Initialisation Wizard Step 1

Select the drive from the menu along the bottom. Either an SD card (which must already be inserted) or a USB hard drive or memory stick plugged into one of the USB ports. The drive will be scanned and the screen will describe the next step in the process:

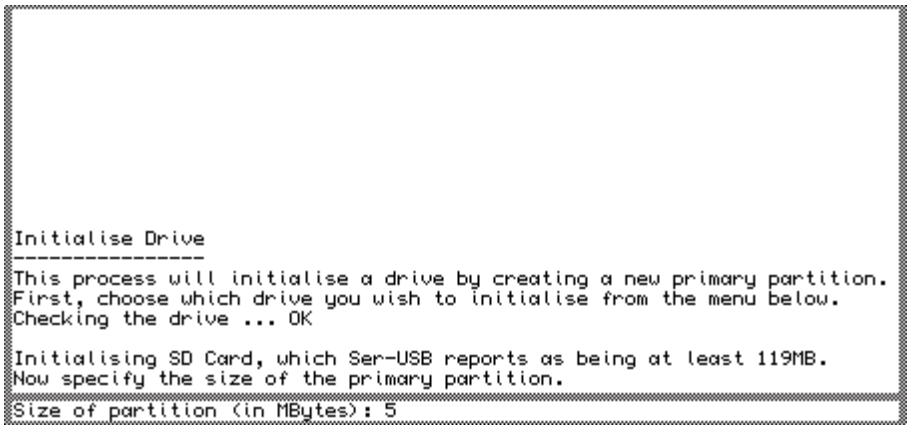


Illustration 8: PM Initialisation Wizard Step 2

At this stage you define the size of the partition in Megabytes. Edit the default value proposed by PM, then hit [ENTER]. If you decide that you do not wish to proceed, use the delete key to remove the suggested value and press [ENTER] (An empty response here will abort the process).

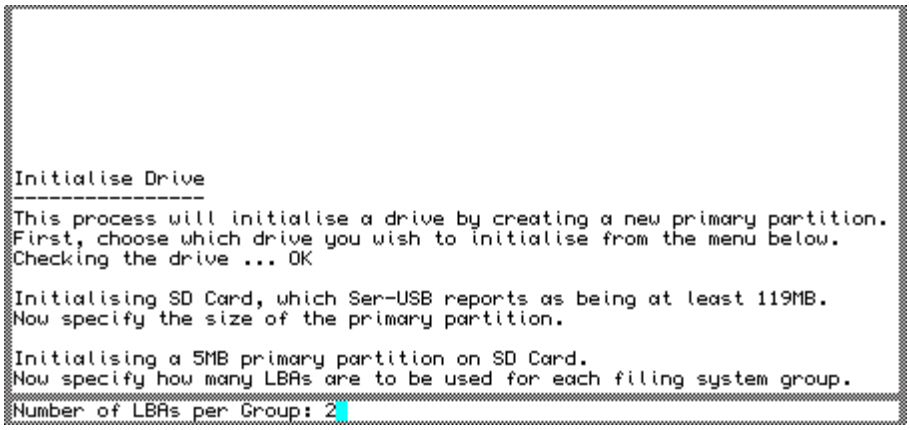


Illustration 9: PM Initialisation Wizard Step 3

You are now being asked to specify how many LBAs should be allocated to each filing system group. PM will have calculated the optimum value for you here, so normally you can just press [ENTER]. Again, if you want to abandon the process at this step, delete all the characters and press [ENTER].

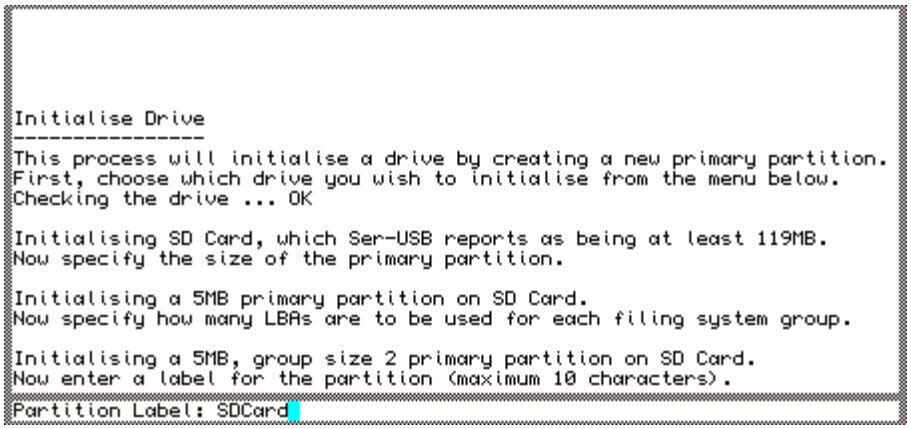


Illustration 10: PM Initialisation Wizard Step 4

Lastly, you will be asked to set the name of the partition. The PM offers the default value of the name of the device, but you will almost certainly want to edit this. For this demonstration, the label was changed to SDCardP1 (to remind us that it's partition 1). You can still abort here, by deleting all the characters and pressing [ENTER]. Otherwise, the PM will build the data structures for the partition in memory, then show you the selections that you have just made and ask you to confirm that you want to go ahead with creating the partition:

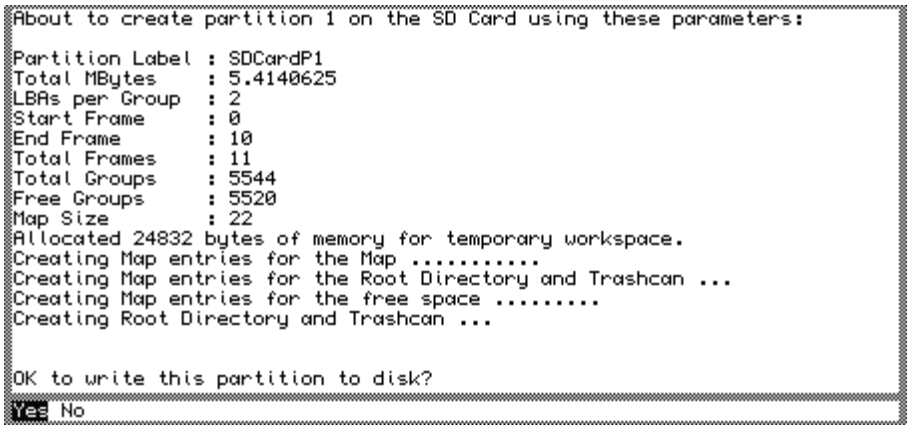


Illustration 11: PM Initialisation Wizard Step 5

Answering Yes will result in a display showing the progress, as the new partition is written to the drive:

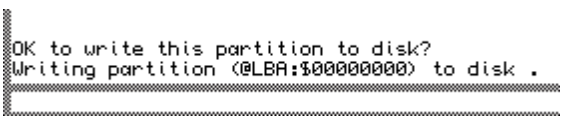


Illustration 12: PM Initialisation Wizard - Partitioning the Drive

Once the process is complete a final message will be displayed to confirm that the operation worked (or, if there was a problem, an error message will be displayed):

Illustration 13: PM Initialisation Wizard - Drive partitioning completed

If you want to check that the partition exists, press [F3] to call up the menu and choose the menu option Partitions. You will see this screen:

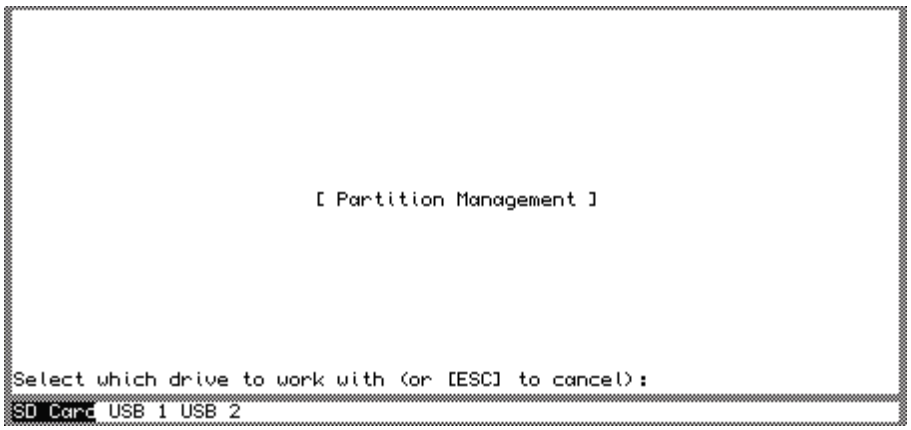


Illustration 14: Partition Management

Select the drive that you just initialised from the menu, to bring up a summary of the primary partition:

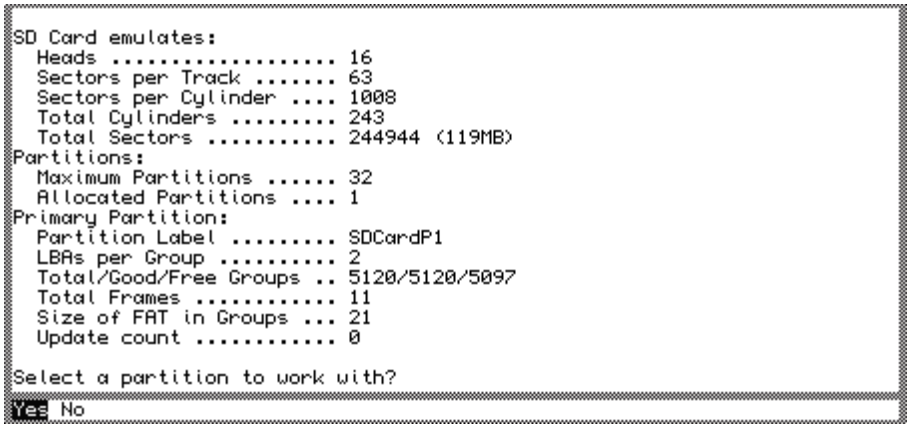


Illustration 15: Primary partition details

Notice that there are a maximum of 32 partitions, of which 1 has been allocated (the one just created; the primary partition). If you want to create another partition, simply answer Yes to the prompt on this screen. You will be presented with a panel from which you can select any of the available 32 partition slots:

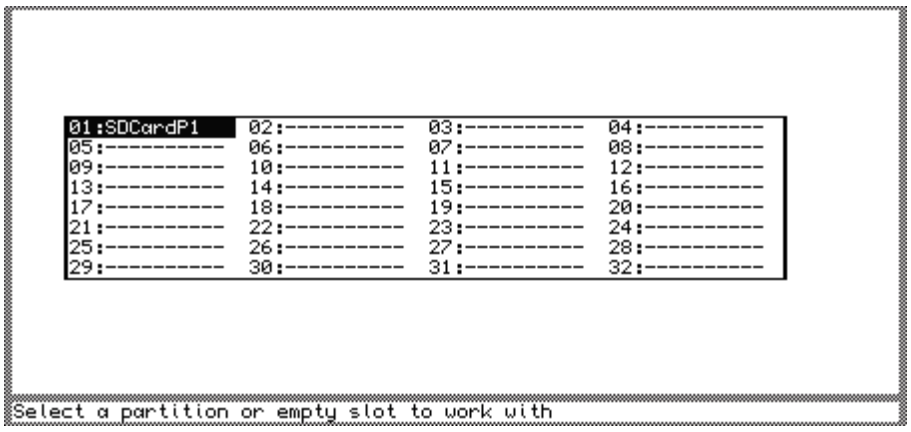


Illustration 16: PM Partition selector

You can move around this screen with the cursor keys, then press [ENTER] when the partition slot that you want to work with is highlighted. To create a new partition on the drive, select any empty slot and hit [ENTER]:

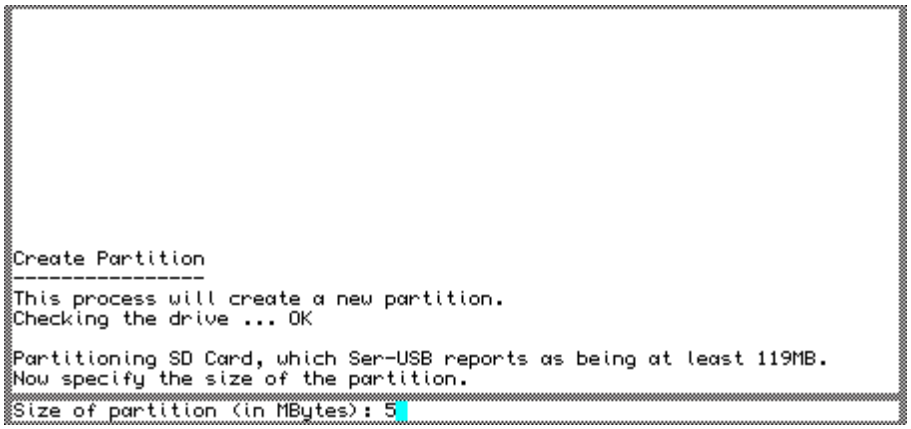


Illustration 17: PM Partition Creation Wizard

You will now be able to go through a similar process to the one that you have just gone through to enter the values for the new partition and write them to disk. Note: It doesn't matter which empty slot you selected in the partition selector screen, the new partition will always be created in the next empty slot. You cannot create gaps in the partition table.

When you get to the end of the process, the screen will look something like this:

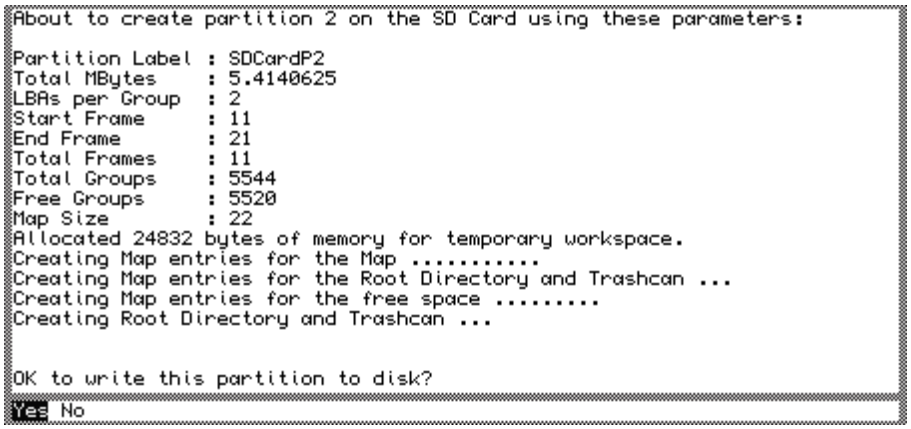


Illustration 18: PM Adding Partition Wizard

If you answer Yes to the prompt, the new partition will be written to the disk and the Master Partition Table updated:

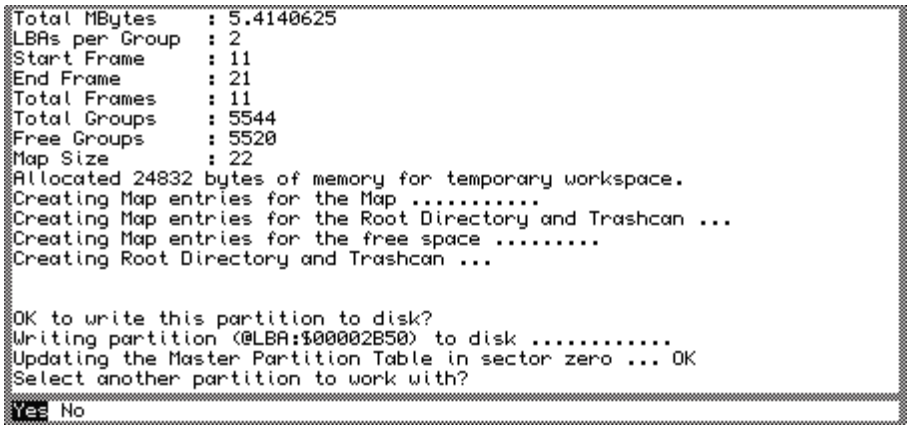


Illustration 19: PM Partitioning Wizard completed

Notice that the part of the message beginning @LBA is showing a different number. This is confirming that the second partition is at a different location on the physical drive, in this case at LBA 11088 (2B50 in hexadecimal). Note also the message about updating the Master Partition Table.

If you answer yes to the prompt "Select another partition to work with?" you will be shown the Partition Selector again, this time with the newly created partition now included:

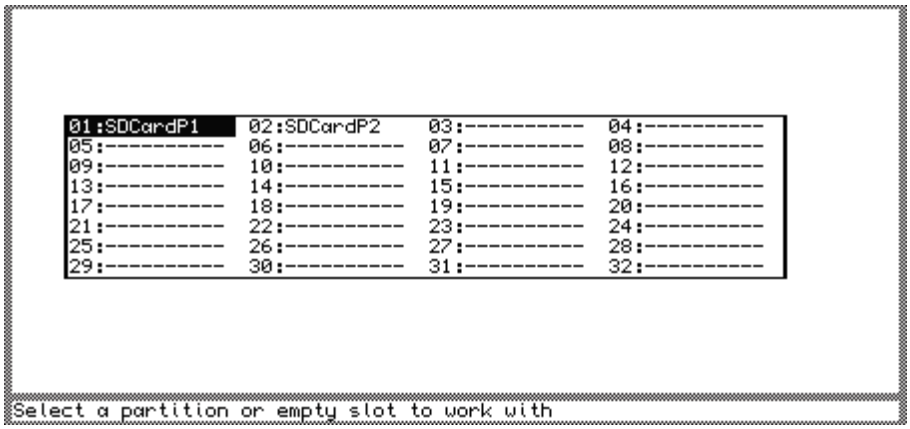


Illustration 20: PM Partition Selector after new partition created.

To use this new partition, you will need to issue a **MOUNT** command from S*BASIC.

Notice that if you select this new partition you will see the following options in the menu bar:

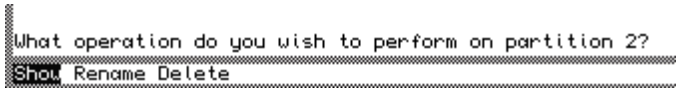


Illustration 21: PM options for second and higher partitions

From here you can:

- Show information about the partition.
- Rename the partition.
- Delete the partition.

These options should be fairly self-explanatory, so they will not be covered in depth here. Note that you can only delete the last partition on a drive. It is not possible to create holes in the partition table.

How to FORMAT the Drive

The Ser-USB FORMAT/SRU_FORMAT commands work with either physical drives (1 to 3) to create a new partition table, or with logical drives (1 to 8).

The Destiny Driver implements the standard S*BASIC FORMAT command, but the Legacy Driver implements its own SRU_FORMAT command. This restriction is because of a limitation in the operating system that prevents the legacy driver from formatting the drive in response to the normal trap #2 io.formt call.

Formatting a Physical Drive

If the drive has not been used with QDOS before you will need to initialise it by doing a physical format. This is done by issuing a FORMAT/SRU_FORMAT command, prefixing the medium name with a “#”.

Examples:

Destiny Driver: `FORMAT "SRU1_#MySDCard"`

Legacy Driver: `SRU_FORMAT 1,"#MySDCard"`

Notice that the Legacy Driver's SRU_FORMAT command requires an additional parameter for the drive number and does not include the drive name in its string parameter.

This command will initialise the currently mounted SD card and create a new partition table and primary partition of the size that you subsequently specify.

The Ser-USB physical drive numbers correspond to:

1	SD Card slot
2	USB mass storage class device plugged into USB Port 1 (the bottom port)
3	USB mass storage class device plugged into USB Port 1 (the top port)

So, to format one of the physical drives, you will use FORMAT "SRU1_#", "SRU2_#" or "SRU3_#" (or SRU_FORMAT 1/2/3,"#"). Note that, because of the '#', you must enclose the medium name in single or double quotes when you are formatting a physical drive.

Make sure that the drive that you want to format is connected to the Ser-USB.

If you have any existing partitions already mounted on that drive then they will be automatically un-mounted before the format proceeds.

IMPORTANT: If you change drives (for example, replace the SD card with a different one, or plug in a different USB drive) you MUST issue a **UMOUNT n** command **before** removing the old drive to completely un-mount it, otherwise the format will fail.

Issue the command **FORMAT "SRUn_#name" / SRU_FORMAT n,"#name"**, where n is a drive number (1 to 3) and name is the medium name (10 characters maximum).

Examples:

```
FORMAT "SRU1_#SDCard01"
SRU_FORMAT 1,"#SDCard01"
```

to format (and partition) the SD Card with a medium name “SDCard01”.

The Ser-USB driver will first attempt to get the maximum capacity of the drive. If this fails or hangs then you may have an SD card that does not support out of capacity LBA reads with USBWiz (see DRIVE_CAPACITY for more details on drive capacities and a solution to this problem).

If this succeeds, you will be presented with the message:

```
This will create the partition table: SRUn_name
Size in MBytes (or 0 for largest possible)?
```

IMPORTANT: Only create a drive of the size that you really need. The larger it is, the more memory is required to hold its map, and the longer it will take to check the map when the drive is mounted. We suggest starting off with 5MB to get a feel for things.

If you hit [ENTER] at this point the process is aborted.

If you type a valid size and hit [ENTER] the following message will be displayed:

```
How many LBAs per Group?
```

One LBA (Logical Block Address) is the equivalent of one sector, i.e. 512 bytes. A group is the smallest unit of space that the driver allocates to files. For most partition sizes, use a value of 2 here, noting that no partition can be larger than 65535 Groups.

If you hit [ENTER] at this point the process is aborted.

If you type an invalid Group size and hit [ENTER] the following message (or similar) will be displayed:

```
Bad combination: either use more LBAs per Group, or make the size
in MBytes smaller
```

This message should be self-explanatory. You are trying to create a partition so big that with the specified group size it would contain more than 65535 groups. This size of partition is, anyway, unlikely to be practical with Ser-USB because the map will take too long to load and save.

After this message you will be returned to the prompt for the size of the volume.

If, on the other hand, you type a valid group size and hit [ENTER] you will then be advised of the consequences and asked if you wish to proceed:

```
WARNING: Any existing partitions on this drive will be removed!
OK to partition drive (Y/N)?
```

Answering Y at this point will begin the format process and you will see the RX/TX LEDs on the Ser-USB flashing rapidly (or not so rapidly if you are running the connection at a low baud rate). The message:

```
Formatting physical drive ...
```

will be displayed, followed, at the end of the process, by:

```
OK
```

On S*BASIC channel #1 there will be a message of the form:

```
nnnn/nnnn sectors
```

Indicating the free/total space on the drive.

Note: although the message says sectors, the values are actually in groups and not sectors.

The formatted volume is now mounted with the same logical drive number as its physical number (1=SRU1, 2=SRU2, 3=SRU3) and is ready for use.

Issue a DIR command, if you like, to confirm that it has worked.

Formatting a Logical Drive

A logical drive is a QDOS SRU drive number in the range 1 to 8. The physical drive and partition to which that number corresponds is entirely up to you, as the MOUNT and UMOUNT commands can link and unlink drives and partitions at will.

When you choose to format a logical drive, the map will be cleared, the root directory reset and the free space returned to the state it was in when the partition was first created. Performing a logical format does not destroy the partition table, so you can safely format a partition without affecting any other partitions on the same drive.

Note: You cannot change the size of a logical drive by formatting it. That was defined at the time the partition was created and can only be changed by deleting the partition and creating a new one with the Ser-USB Partition Manager.

To format a logical drive, issue a normal FORMAT/SRU_FORMAT command, without the '#' in front of the medium name.

Examples:

Destiny Driver: `FORMAT SRU6_PartSix`

Legacy Driver: `SRU_FORMAT 6,"PartSix"`

This will format the partition which is currently mounted as logical drive 6.

Before formatting can proceed a check will be made to see if there are any files open on the drive. If there are, then the format will be aborted with an "In Use" error.

After issuing the format command, you will be warned that the operation will erase any existing data on the drive (partition) and asked to confirm that you want to proceed:

```
WARNING: Any existing data on this drive will be erased!
OK to format logical drive (Y/N)?
```

If you press Y, the format process will begin.

You will see the message ...

```
Formatting logical drive ...
```

followed, at the end of the process, by

```
OK
```

At this point the partition's map and root directory have been cleared and all data originally on the drive has become inaccessible.

Answering N to the confirmation prompt will abandon the format.

Native Driver S*BASIC Procedures and Functions

The Ser-USB driver installs the following new procedures and functions into S*BASIC:

- MOUNT
- UMOUNT
- DRIVE_CAPACITY
- SRU_FORMAT
- SRU_BAUD
- SRU_PORT
- SRU_USE
- SRU_OK()
- SRU_BASE()
- SRU_VER$()
- SRU_STATUS()
- SRU_FLAG()
- SRU_ERR$()

MOUNT Number, Drive, Partition

MOUNT Number

Mount the specified physical drive and partition as the SRU device with the given number. The short form of the command mounts a logical drive from partition 1 on the physical drive with the same number.

Before a storage device can be used it has to be mounted as a QL drive. There are eight drive numbers associated with the Ser-USB driver: SRU1 to SRU8. Any partition on any physical drive that the Ser-USB recognises can be mounted as any one of those drive numbers.

Examples:

```
MOUNT 2,2,1
```

Mount partition 1 on drive 2 as SRU2.

```
MOUNT 1
```

Mount partition 1 on drive 1 as SRU1.

UMOUNT Number

Unmount the specified SRU device.

This removes the mapping from the physical storage device to the QDOS drive number, allowing the drive number to be re-used by attaching it to a different physical drive/partition. Note the spelling of the command; like the Linux command with the same function, there is no N after the U.

Other device drivers for the QL have tended to use a single command like WIN_DRIVE to handle the functions of mounting and un-mounting. For the Ser-USB driver a decision was taken to implement two distinct commands for greater flexibility and clarity.

Example:

```
UMOUNT 2
```

Un-mount SRU2.

DRIVE_CAPACITY Number%,Size

The USBWiz module which Ser-USB uses has no mechanism for getting the physical size of a volume that has been mounted for direct I/O.

The Ser-USB Destiny Driver gets around this by trying to read from various LBAs (Logical Block Addresses) until it finds the first size that succeeds. Unfortunately, some (mainly older) SD cards, when used with the USBWiz module, do not support out of range LBA requests, with the result that the Ser-USB will lock up and need to be reset.

The Ser-USB Legacy Driver bypasses this check altogether and assumes that every physical drive has a capacity of 2GB, so DRIVE_CAPACITY must be used if

a) the drive has a capacity less than 2GB or

b) the drive has a capacity > 2GB and you want to use some of that space.

This command allows you to manually specify the size of the drive, so that the driver bypasses this check entirely.

Number% is the Ser-USB physical drive number (1 to 3).

Size is the size in 512 byte sectors.

Example:

```
DRIVE_CAPACITY 1,262144
```

Set the size of the SD Card to 128MB; i.e. (128*1024*1024)/512

IMPORTANT: If you are using the Destiny Driver and you have a drive that fails with out or range reads then you **MUST** issue a DRIVE_CAPACITY command before attempting to FORMAT it.

SRU_FORMAT [#Ch,]Drive,Label$

This command is only implemented by the Legacy Driver.

The QDOS/SMS FORMAT command is not supported by the Legacy Driver and any attempt to invoke the io.formt trap will return err.ni with the address of the driver's format routine in d1. In other words, formatting must happen in user mode, either with the supplied S*BASIC command or by a direct call to the address returned in d1.

The main difference between SRU_FORMAT and FORMAT is that the former takes a separate integer drive number parameter instead of including the drive name in the label. SRU_FORMAT may also take an optional channel number which will be used for all user interaction (including messages and prompts for input).

Examples:

```
SRU_FORMAT 1,"#SDCard"
SRU_FORMAT #2,2,"USBStick"
```

SRU_BAUD BaudRate

Sets the baud rate for communication with the Ser-USB. The values listed below are allowed, but not all will work depending upon the hardware configuration. In particular, note that a standard QL without superHermes cannot support baud rates higher than 4800 even if you are able to set that rate.

- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 57600
- 115200
- 230400

SRU_PORT Name$

This command can be used to change the port to which the Ser-USB is connected.

To use: ensure that there are no current operations with the Ser-USB in progress (wait at least five seconds with both the TX and RX LEDs out) then carefully unplug the serial lead and plug it into the new port. Finally, issue the SRU_PORT command with the new port name. **Do not** reset the Ser-USB.

Example:

```
SRU_PORT "ser2hr"
```

This is of most use with the ROM Legacy Driver and the superHermes which requires the IPC extensions to be loaded before the additional serial ports can be accessed. Thus the machine can be booted with the Ser-USB connected to, say, SER1 at 4800 baud. From there a BOOT program could load the IPC extensions, then use SRU_PORT to switch the Ser-USB to SER3 (the fast serial port).

SRU_USE Name$

Change the device name of the driver. For compatibility with older programs that cannot recognise devices other than those installed on the basic QL, it is possible to rename the Ser-USB driver to something else.

Example:

```
SRU_USE “MDV”
```

The Ser-USB now pretends to be a Microdrive.

SRU_USE without a parameter resets the driver name to SRU.

SRU_OK()

Returns 1 if the Ser-USB driver has been successfully loaded, or 0 if not. This is useful for conditional boot programs or other applications where actions should only be performed if the Ser-USB is connected.

SRU_BASE()

Return the address of the Ser-USB driver's variables. If this fails, it means that the Ser-USB driver is not installed.

SRU_VER$(Mode%)

Return version information as a string.

If the optional parameter Mode% is omitted, or is zero, this function returns the full driver version string (including core driver build number and status) as a string.

Valid values for Mode% are:

1 : the four character hardware version string is returned.

2 : the four character hardware type string is returned (This will be "UWZL" for the Legacy Driver and "UWZS" for the Destiny Driver).

3 : returns a four character string containing the compile-time options used when the driver was built. The first character will always be a '2', signifying an EDDE 2 core, the remaining three characters will either be a '-' or an alphanumeric option letter.

SRU_STATUS()

This function is primarily intended for debugging purposes. It returns the pending transaction state of the driver as a bit field.

Bit 0 = Supervisor Stack Pointer set to Auxiliary Stack Space.

Bit 1 = The driver is inside a nested call.

Bit 2 = The driver is in the process of opening a file.

Bit 3 = One or more disk maps must be flushed to disk.

Bit 4 = A suspended transaction was initiated by the device driver itself.

Bit 5 = The driver is in the process of closing a file.

Bit 6 = Driver is handling a trap #3 call.

Bit 7 = A previous I/O transaction went into suspense and has not subsequently been released.

Bit 15 = The I/O Servicer Lock is set.

SRU_FLAG([Flag%] [,Action%])

There are seven flags which can be used to control/interrogate the behaviour of the driver at run-time. This function allows you to read their current values and to change them if needed.

Flag% is the number of the flag in the range 0 to 6.

Action% is 0 to clear the flag, 1 to set it and -1 to test it. Note that if Action% is omitted then it defaults to -1 (test).

SRU_FLAG always returns the value of the flag before the operation was performed.

The only flags currently used are:

0 = Inhibit Extended Open Handler (Non-Fatal): If Flag 0 is set then it will prevent the driver from using its extended open handler and instead returns err.nc (Not Complete) if the driver is busy when a trap #2 io.open call is made. This would be mandatory for any program that tries opening a file while in supervisor mode. It may be possible for the calling program to recover from this and continue.

1 = Inhibit Extended Open Handler (Fatal): This has the same effect as setting Flag 0, except that it returns err.iu (In Use) instead.

6 = FAT Driver is loaded: DO NOT set this flag yourself - it will be set by the FAT Driver if it is loaded on top of the native Ser-USB driver.

SRU_ERR$

Returns a four character string containing the last hardware error code. If there has been no error, the string returned will consist of four null (CHR$(0)) bytes.

Extra S*BASIC Procedures and Functions

Previous versions of the Ser-USB driver included the file drv_exts_bin, that contained additional procedures and functions intended for use by third party tool developers. This file is no longer supplied (or supported) but an EDDE 2 compliant replacement is available from Memory Lane Computing for anyone who has made use of the functions that were included.

Note: The functions for direct loading and saving of sectors (LBAs) on any Ser-USB volume that were in the Driver Extensions are now included in the Ser-USB FAT Driver.

Obsolete Modules

Previous versions of the Ser-USB drivers included the following modules:

- The Queue Manager
- The Driver Command Manager *
- The Driver Status Monitor

These are no longer supported (or needed) and will not work with the 2.0 drivers.

In addition, the API documented for the Ser-USB 1.x drivers is no longer supported, although equivalent functionality is now accessible through the EDDE 2 Link Layer Driver.

** A version of the Driver Command Manager is included with the Ser-USB FAT Driver but it has no functionality for interacting with the Native Driver. Such interactions are now conducted through the EDDE 2 Link Layer Driver by making sd.extop calls to the EDDE device.*

Direct Sector Access

For compatibility with existing software that does direct sector I/O on hard disks, the Ser-USB driver supports this facility on native QDOS volumes.

To do this, open the special file "*D2D", as in:

```
OPEN #3,"SRU1_*D2D"
```

The driver also allows the shortened form:

```
OPEN #3,"SRU1_*D"
```

The channel so opened has the following limitations:

- Data must be read or written in 512 byte blocks.
- The file pointer is interpreted as a sector (LBA) number, relative to the start of the partition.
- Only absolute file pointer movements are permitted.
- It is not possible to read a sector that lies beyond the end of the partition. Any attempt to do so will return "End of File".
- Note that no files can be open on the logical drive with which you wish to perform direct I/O.

Direct sector access on non-native disks (e.g. FAT), or access to LBAs outside partition boundaries, can be achieved with UZ_PUTLBA, UZ_GETLBA etc. in the FAT Driver.

Ser-USB FAT Driver

The Ser-USB FAT (File Allocation Table) Driver is an alternative software package for the Ser-USB or other USBWiz-based devices. The Ser-USB Native EDDE 2-based driver implements a native QDOS file system, but at the cost of performance, some compatibility and relatively high memory utilisation; all issues that make it less than ideal for base QL systems.

The FAT Driver, on the other hand, leverages the full power of Ser-USB's onboard USBWiz module to handle all filing system management operations by using only FAT16 or FAT32 volumes. Because the USBWiz is doing most of the work, the software on the QL side benefits from significantly reduced memory requirements and complexity.

The downside of this is that filenames are limited to the original DOS 8.3 format (this is a restriction of the USBWiz) and support for application programs to work directly with files on the Ser-USB is very basic. However, the driver is extremely well suited to the original design goals of the Ser-USB as a tool for transferring files between systems; the FAT Driver now makes it even easier to do this between QLs, PCs, Macs ... in fact any machines running an OS that can read/write FAT disks.

The driver is made up of two components:

*The S*BASIC interface*

This provides additional commands to perform common filing system operations with files on the Ser-USB. For example, you UZ_COPY a file instead of using COPY if either the source or destination file is on the Ser-USB.

The Driver Command Manager (DCM)

This optional service can be started only when needed. When it is running it provides spooling and serving capabilities that allow programs running on the QL to access a file on the Ser-USB as if it were part of the QDOS filing system. There are special S*BASIC commands to route an S*BASIC channel to the DCM, or just opening a file on the "UWZ" device will do the same thing automatically. See the section on *Spooling and Serving* for details of this feature.

Because the DCM is a user mode process it does not suffer from the problems of doing serial I/O in supervisor mode which plagued early versions of the original Ser-USB driver. Instead, it uses native QDOS pipes to communicate between the Ser-USB and the QDOS I/O Sub System (IOSS).

Starting the Driver

Like the native Ser-USB driver, the software comes in RAM or ROM versions; the ROM version is inactive until started by the command UWZ_START (which is documented in the section *Ser-USB FAT Driver ROM*).

The RAM version is started by loading the file **usbwiz_RAM_bin**, either with LBYTES followed by CALL or with Toolkit II's LRESPR.

The driver prints a message identifying itself to channel 0:

```
Ser-USB FAT Driver v2.00 by Memory Lane Computing Ltd, 2012
```

At this point you have 1.5 seconds to press one of the following keys, which modify the operation of the driver:

[ESC]

Prevents the BOOT file (if present) from being run.

[F4]

Assumes that the Ser-USB is already set to the configured baud rate and so will not attempt to change the rate. This is useful if you have rebooted but have not reset the Ser-USB.

[F5]

Displays the prompt:

```
F5 pressed. Enter config string:
```

at which point you can enter a long integer value consisting of baud rate + serial port number (see the UWZ_START command in the section *Ser-USB FAT Driver ROM* for more details).

After pressing a key, you have a further 1.5 seconds to press another, so that you could combine [ESC] and [F4], if, for example, you wanted to inhibit running the BOOT file and also wanted to tell the driver that the Ser-USB was already set to the correct baud rate.

Note that [F4] and [F5] cancel each other out. You cannot use [F4] to tell the driver that the Ser-USB is already set to the baud rate that you specify using [F5], only that the Ser-USB is already set to the driver's *configured* baud rate, as per its Config Block.

Whether you have used any of the above options or not, the driver will then try and establish communications with the Ser-USB.

If the Ser-USB native driver is already loaded, the FAT driver will use the existing connection already established to the Ser-USB.

If the above steps succeed, the driver will then set the date and time on the USBWiz module in the Ser-USB to the current date and time on the QL; this is so that any changes to the FAT filing system are correctly date stamped.

The next stage of initialisation is normally to try and mount a FAT filing system on the SD Card. This will **not** happen if the Ser-USB Native Driver is already loaded and the next step will be skipped.

If this is successful, the driver looks for a file called BOOT (which it expects to be an S*BASIC program). If the file is found, the driver will LRUN it, by stuffing its contents into the keyboard queue, line by line. This mechanism has to be used, because it is not possible to initiate a "real" LRUN command with a file on the FAT file system.

When these steps have been completed, the driver is ready to be used through the S*BASIC interface. See the sections *FAT Driver S*BASIC Procedures* and *FAT Driver S*BASIC Functions* for full details.

A special device driver called "UWZ" is also installed, but this does not behave like a normal directory device driver. See the Section on *Automatic Spooling and Serving* for a description of how the UWZ device works.

Using both drivers together

As mentioned above, It is possible to load both the Ser-USB native driver and the FAT driver at the same time. In this case, the native driver must be loaded first, so that the FAT driver can find it and establish an exchange of information.

Support for both drivers loaded together is still experimental and you should use this feature with caution. The drivers automatically switch between modes whenever they are accessed so it should be safe to copy files between QDOS and FAT volumes on the same Ser-USB. In addition, the UZ_LOCK function is provided to lock the native driver while FAT operations are being performed.

However, even though in testing no problems were detected, all of these safeguards are not guaranteed to be foolproof, and there is the possibility that data corruption might result if you intersperse native and FAT file operations. Thus, please use this feature with care until you are certain that it works reliably in your environment.

FAT Driver S*BASIC Procedures

This section lists the new S*BASIC procedures installed by the Ser-USB FAT Driver. The S*BASIC interface should be considered as the preferred way of doing FAT file operations. Spooling and Serving (described later in this manual) is an advanced mechanism to provide some limited support for using FAT through QDOS I/O calls, but it is not the recommended way in which to use this driver.

IMPORTANT: The procedures in this section only work if the FAT Driver is loaded and only with FAT volumes!

UZ_DCMSTART

Start the Driver Command Manager (DCM).

The DCM is a background task that provides spooling services for accessing files on the Ser-USB through native QDOS IOSS calls. If you do not wish to use Spooling and Serving (See UZ_SPOOL and UZ_SERVE) then you do not need to start it.

See the section *Driver Command Manager* for more details.

UZ_DCMSTOP

Stop the Driver Command Manager.

UZ_MNT Drive%

Mount a FAT file system on the Ser-USB.

Before you can use an SD Card or USB drive plugged into the device, it must be mounted first. The UZ_MNT command is used for this. Unlike the MOUNT command in the Ser-USB EDDE driver this has no effect on the QL side; it simply instructs the Ser-USB to mount the drive ready for access.

Drive% is a number from 1 to 3, where:

1	SD Card
2	USB Port 1
3	USB Port 2

UZ_SW Drive%

Switch between mounted file systems on the Ser-USB.

Once a drive has been mounted on the Ser-USB it becomes the "current drive". In other words, all file handling commands will use the last mounted drive until instructed otherwise. If more than one drive is already mounted, you can switch between them using the UZ_SW command. This is analogous to typing C: or D: etc. in a DOS command prompt.

Drive% is a number from 1..3, where:

1	SD Card
2	USB Port 1
3	USB Port 2

UZ_DIR [#Channel%][,][Drive%]

Display a directory of a currently mounted drive.

The output of the UZ_DIR command looks like this:

```
BOOT     .       ...a   420
MYDIR    .       <DIR>  0
VOID     .BIN    ...a   90
QBREAD   .BAS    ...a   1122
QBWRITE  .BAS    ...a   1118
GWDISS   .EXE    ....   12776
REDEFINE.IN      ....   800
USBWIZ   .ASM    ....   44789
TEST1    .BAS    ....   183
GOT      .EXE    ....   17188
TEST2    .BAS    ....   444
SPOOL    .TXT    ....   634
```

The files' DOS attributes are displayed in the third column, the sizes in the fourth. Note that DOS attributes are completely ignored by the Ser-USB FAT Driver. Their QDOS equivalent, the file header, is stored in the form of a prefix header when it is necessary (for executable files).

By default the output from this command is sent to channel #1, but this can be overridden by specifying the Channel% parameter.

UZ_DIR will display the directory of the current drive, as set by the most recent UZ_MNT or UZ_SW commands, or you can explicitly specify a drive using the Drive% parameter.

UZ_FORMAT

Quick Format the media currently mounted on the Ser-USB.

You cannot specify a medium name and you cannot do a low level format with this command. If either of these things need to be done, you will have to do them on a PC or Mac or any other system supporting the FAT file system. This is a limitation of the USBWiz module.

UZ_COPY "Source Destination"

Copy a file to/from the Ser-USB.

The parameter to this command consists of a single string containing two filenames separated by a single space. The first filename is the Source file, the second is the Destination. To signify that a file is located on the Ser-USB, its name must begin with a colon (":").

One filename must be on the Ser-USB; one on the QL. Copying files from one Ser-USB FAT drive to the other is not supported, nor is copying files solely on the QL side.

You can specify a drive for the Ser-USB file, by including a drive selector after the initial colon. This is of the form "n:", where n is a drive number from 1 to 3, as documented for the UZ_MNT and UZ_SW commands.

If the file is executable a prefix header will be pre-pended to the file when copying TO the Ser-USB, and restored when copying FROM it. Prefix headers use the same format that is used by Q-emuLator to store executable files on the host filing system.

If the file already exists on the destination, it must be deleted first or an error will be reported.

No surplus spaces are allowed anywhere in the parameter string. QL filenames with spaces are not supported; DOS 8.3 filenames cannot have spaces in them.

Examples:

```
UZ_COPY "FLP1_Asteroids_bas :ASTROIDS.BAS"
```

Copy the file FLP1_Asteroids_bas to ASTROIDS.BAS on the current Ser-USB drive.

```
UZ_COPY ":2:TOOLKIT2.BIN WIN1_Toolkit2_bin"
```

Copy TOOLKIT2.BIN from the USB drive connected to USB port 1 to WIN1_Toolkit2_bin.

UZ_LOAD Filename$

Load a file from the Ser-USB by stuffing its contents into the keyboard queue. Filename$ should be the name of a S*BASIC program file.

The maximum file size is 32K.

UZ_LRUN Filename$

Load and run a file from the Ser-USB by stuffing its contents into the keyboard queue. Filename$ should be the name of a S*BASIC program file.

The maximum file size is 32K.

UZ_FLD 0|1

Set fast load mode.

When set (1), UZ_LOAD does not pause between lines as they are stuffed into the keyboard queue. This should only be used on very fast hardware or with a QL emulator, otherwise characters will probably be lost.

The default is not set (0).

UZ_EX Filename$ [,#Ch ...][,Command$]

Load and execute a file from the Ser-USB. One or more S*BASIC channels may optionally be passed to the job, along with a command string.

The file must have an executable prefix header or this command will report "Bad Parameter".

Note: Some programs make an assumption about the way in which they have been loaded into memory. EXEC (ROM), EX (Toolkit II), EXECUTE (Turbo Toolkit) all load the job's code into memory immediately following the job's header. UZ_EX first loads the file into memory (so that it can get the file prefix header) then it creates a job containing a short stub that jumps to the previously loaded code.

If a program assumes that its header is immediately before the start of its code, and it tries to access the header directly, or if the program assumes that its data area follows on immediately after its code area, then the program will fail using the UZ_EX method. Most likely this will result in a catastrophic system crash, either immediately the program is executed or very shortly afterwards.

The reason that UZ_EX (and UZ_EW) do it this way is for performance reasons. There are no QDOS headers on a FAT volume (obviously) so the prefix header at the start of the file has to be read before the size of the job header can be known.

If this causes a problem because an executable that you wish to be able to run from a FAT drive does not work correctly, then you can load a special extension (uzx_bin) which implements two new commands UZX and UZXW. These commands are slightly slower but they mimic the way that other execute utilities (such as EXEC, EX and EXECUTE) operate and so should cause fewer problems.

UZ_EW Filename$ [,#Ch ...][,Command$]

Load and execute a file from the Ser-USB and wait for completion. See UZ_EX for details of parameters.

UZ_LRESPR Filename$ [,#Ch ...][,Command$]

Load and install an extension from the Ser-USB. Unique to the Ser-USB driver's LRESPR command is the ability to pass one or more S*BASIC channel numbers and a command string, although the extension being loaded has to be written to take advantage of this feature. In this case, the signature passed in d5 is useful if code needs to determine whether it is being called with parameters.

The called code gets passed the following:

d5 = ASCII Signature 'USBW'
d6 = ASCII version number 'N.NN'
a0 = Pointer to list of channels (if any)
a2 = Pointer to parameter string (if any)
a3 = Pointer to base of driver variables
a5 = Pointer to API entry point

UZ_LBYTES Filename$, Address

Load a file from the Ser-USB into memory.

UZ_SBYTES Filename$, Address, Length

Save memory (overwrite) to a file on the Ser-USB.

UZ_SBYTES_A Filename$, Address, Length

Save memory (append) to a file on the Ser-USB.

UZ_DEL Filename$

Delete a file on the Ser-USB.

UZ_REN "Old New"

Rename a file/directory on the Ser-USB.

UZ_MD Directory$

Make a directory on the Ser-USB.

UZ_RD Directory$

Remove a directory on the Ser-USB.

UZ_CD Directory$

Change directory on the Ser-USB.

QL_CD Directory$

Set the QL directory. On a system with a Level 2 device driver this will set DATAD$.

If no parameter is supplied, print the current directory to the console (channel #0).

Note: No checks are performed on the parameter. It is up to the user to ensure that it is in the correct format; in particular that it starts with a valid device name and ends with an underscore.

UZ_OPEN [#Ch,]Filename$,Mode$

Open a file on the Ser-USB for reading or writing. The Ser-USB has four channels available for file handling; 0 to 3. If the channel number is omitted then #2 is used. This is to avoid clashes, as many UZ_xxx file handling commands make use of channel 1, and channel 0 is used for DCM spooling and serving.

Note that USBWiz channel numbers are not the same as QDOS S*BASIC channel numbers. They refer specifically to the USBWiz module and have no other significance to the QL.

UZ_CLOSE [#Ch]

Close a file that was previously opened with UZ_OPEN on the specified channel.

UZ_PUTS([#Ch,]String$)

Write a string to the file currently open on the Ser-USB.

UZ_FLUSH

Flush the Ser-USB input queue.

UZ_RESET

Re-sync if the Ser-USB has to be reset. This command does not actually physically reset the Ser-USB; this cannot be done from the QL and must be done with the reset button on the device. What this actually does is to select 9600 baud and flush the Ser-USB input queue - essential if you have just been forced to push reset!

Unfortunately this command cannot be used on a standard QL because it does not support changing the baud rate to 4800.

UZ_BAUD Rate

Set the Ser-USB Baud Rate.

UZ_GETLBA Drive, LBA, Buffer

Read one LBA from the Ser-USB into memory.

UZ_PUTLBA Drive, LBA, Buffer

Write one LBA to the Ser-USB from memory.

UZ_GETLBAS Drive, LBA, Count, Buffer

Read the contents of consecutive LBAs into memory.

UZ_PUTLBAS Drive, LBA, Count, Buffer

Write the contents of memory into consecutive LBAs.

UZ_PORT Name$

Change the port through which the Ser-USB is connected. (See SRU_PORT in the Native Driver section for a description of this command).

UZ [#Ch,] Command$

Send a command string to the Ser-USB and display the result to the console or specified channel.

UZ_CC [#Ch,] Filename$

Copy a file's contents from the Ser-USB to the specified channel (default #1).

Note: Maximum file size = 32K.

UZ_SCLK [DOSDateTime$]

Set the Ser-USB Clock.

Omit the parameter to use the current Date/Time.

Note: The Ser-USB clock is automatically synchronised with the current QL date/time when the driver is first loaded.

UZ_SPOOL [#Ch, Filename$]

Start spooling from an existing S*BASIC channel to a file on the Ser-USB. Note that the file is opened in [A]ppend mode, so that data will be added to the end of it.

Everything that is subsequently written to the specified channel is routed to the Driver Command Manager (DCM) which then spools it to the file. If the DCM is not running when this command is first used, then it will automatically be started.

When used with no parameters, this command stops the spooler.

The spooler uses Ser-USB channel 0, so while spooling is active that channel number is not available for any other operations.

Note that you need a valid S*BASIC channel number in order to use this command. Unfortunately, there is no reliable way in which an entry can be added to the S*BASIC channel table automatically for you, so this has to be done manually. The channel will be closed and its number reassigned to the Driver Command Manager's Client Write pipe.

The preferred method is to use the function UZ_SPL$; this returns a special filename that is guaranteed to be reserved for this purpose in all future software versions. (You should always open this special file in shared mode).

So, for example:

```
OPEN_IN #3,UZ_SPL$
UZ_SPOOL #3,"SPOOL.TXT"
```

Will route anything printed to S*BASIC channel #4 to the file SPOOL.TXT on the current Ser-USB drive.

The command UZ_SERVE operates in the reverse direction, allowing a file on the Ser-USB to be read through an S*BASIC channel, but note that the current version of the software only supports a single spooling operation (UZ_SERVE or UZ_SPOOL) at a time; you cannot have both in operation, and you cannot Spool or Serve more than one file at a time.

IMPORTANT: DO NOT close the channel assigned in this way, or you will close one of the DCM's pipes. Instead use the UZ_CHCHG command first.

See *Spooling And Serving* for an alternative way of doing this, and for more details of the integration with the QDOS IOSS.

UZ_SERVE [#Ch, Filename$]

Start spooling from a file on the Ser-USB to an existing S*BASIC channel.

This command works exactly like UZ_SPOOL, except that it operates in reverse. It opens a file on the Ser-USB, reads from it, and sends the file contents, via the DCM's Client Read pipe, to the specified S*BASIC channel (see UZ_SPOOL for the method to obtain a suitable channel number).

Example:

```
OPEN_IN #3,UZ_SPL$
UZ_SERVE #3,"SPOOL.TXT"
```

This command allows data to be read from SPOOL.TXT with a command such as:

```
INPUT #3,A$
```

With no parameters, this command stops the spooler.

As mentioned under the description of the UZ_SPOOL command, you cannot use UZ_SERVE and UZ_SPOOL at the same time, and you cannot have multiple files being spooled or served.

There is a further limitation with UZ_SERVE in that it shares the same 512 byte buffer that is used by the UZ_GET$ function. If calls to UZ_GET$() are made while a UZ_SERVE is in operation there is a risk of the data getting mixed up, so this should be avoided.

IMPORTANT: DO NOT close the channel assigned in this way, or you will close one of the DCM's pipes. Instead use the UZ_CHCHG command first.

See the section *Spooling And Serving* for an alternative way of doing this, and for more details of the integration with the QDOS IOSS.

UZ_CHCHG #Ch%,Name$

Change an existing S*BASIC channel number (default #3) to refer to the specified file/device name.

IMPORTANT: The existing channel is NOT closed first.

The main use of this command is when you previously assigned a channel number with UZ_SERVE or UZ_SPOOL, and you have now finished the operation and don't need the channel anymore. Closing the assigned channel number with a normal S*BASIC CLOSE command would close one of the DCM's pipes (which is obviously not what is wanted!).

Instead, to close the channel safely, do this:

```
UZ_CHCHG #3,UZ_SPL$
```

And then:

```
CLOSE #3
```

If you omit the device/file name parameter to UZ_CHCHG it will default to UZ_SPL$.

If you omit the channel number it will default to #3.

FAT Driver S*BASIC Functions

This section lists the new S*BASIC functions installed by the driver.

IMPORTANT: The functions in this section only work if the FAT Driver is loaded and only with FAT volumes!

UZ_COPYF("Source Target")

Copy a file to/from the Ser-USB.

This is a function version of the UZ_COPY command, which otherwise operates in exactly the same way. See the description of UZ_COPY for detailed information.

UZ_COPYF Returns 0 for success, else error code.

UZ_HDRS(State%)

Set/test whether file headers are processed during copy operations. If set, a Q-emuLator-style prefix header is pre-pended to files of types 1 and 2 before they are written to the FAT file system, and extracted when they are read.

State% = 0 Ignore headers.

State% = 1 Process headers (the default)

State% = -1 Return current setting.

UZ_FLEN(Filename$)

Return the length of a file on the Ser-USB.

Note that if the file includes a prefix header (30 bytes), it will be included in the file length.

UZ_FATTR(Filename$)

Return the (FAT) attributes of a file on the Ser-USB.

The attributes are returned in a FAT-standard byte-sized bit field as follows:

Bit(s)	Description
7..6	Reserved
5	Archive
4	Directory
3	Volume ID
2	System
1	Hidden
0	Read Only

UZ_FDATE(Filename$)

Return the date stamp (as a FAT long word bit field) of a file on the Ser-USB.

The value returned is the 32-bit standard structure used in the FAT filing system. For example, 0x34212002 is 01/01/2006 – 04:00:04.

Bits	Field	Description
31..25	Year1980	Years since 1980
24..21	Month	1..12
20..16	Day	1..31
15..11	Hour	0..23
10..5	Minute	0..59
4..0	Second2	Seconds divided by 2 (0..30)

The DOS_DATE$ function can be used to convert this value to a (slightly more useful) string.

UZ_FTEST(Filename$)

Test whether a file exists on the Ser-USB.

UZ_MTEST()

Test whether there is media currently mounted on the Ser-USB.

UZ_MSIZE()

Return the capacity of the media currently mounted on the Ser-USB.

UZ_MFREE()

Return the free space on the media currently mounted on the Ser-USB.

UZ_CDRIVE%()

Return the currently selected drive on the Ser-USB.

The drive is changed with either UZ_MNT (mount) or UZ_SW (switch).

UZ_VER$()

Return the Ser-USB FAT Driver version string as four characters "N.NN".

UZ_HWVER$()

Return the version string of the USBWiz module in the Ser-USB as four characters "N.NN".

UZ_WRITE% (String$)

Write a string to the Ser-USB channel.

Returns 0 for success, else negative error code.

This command is provided to allow direct communication with the USBWiz module in the Ser-USB.

UZ_READ$(Bytes%)

Read a string of up to Bytes% characters from the Ser-USB channel.

This command is provided to allow direct communication with the USBWiz module in the Ser-USB.

UZ_FETCH% (Template$)

Fetch a Ser-USB response and match the template.

The string should be in the form of the response expected from the USBWiz module to the last string sent with UZ_WRITE%.

Characters in the template must match exactly, including carriage returns.

Special symbols are used to signify the positions of parameters in the string; when matched, the values are extracted and stored in the Ser-USB Result Table so that they can be retrieved with UZ_RESULT$. These symbols are as follows:

Where '%' characters appear in the template, each contiguous group of these is treated as a value to be extracted and is matched by the same number of characters in the input stream. These results are stored in the table

Where an '=' character appears in the template, it is followed by a word that indicates how many bytes are expected from the input stream. These bytes are counted, but not copied to the table, and the number must match for success. The actual data read can be extracted from the 640 byte input buffer located at offset $500 (1280) from the base of the driver variables. This buffer will contain the entire string received from the Ser-USB; its absolute address in memory can be found with UZ_VARS(1280).

UZ_RESULT$(Index%)

Fetch an entry from the Ser-USB Result Table.

After calling UZ_FETCH% to match a response from the Ser-USB, this function can be used to extract one of the returned values.

UZ_OK()

Get a response from the Ser-USB.

This function can be used in conjunction with UZ_WRITE% to perform complex operations on the Ser-USB that are not supported by the driver's built-in commands and functions. (Read the USBWiz documentation for detailed information about the other functions that it can perform besides accessing file systems).

Return 1 if succeeded and it's OK, otherwise 0.

UZ_BUSY(State%)

This function can be used to modify/test the state of the USBWiz BUSY flag; a software flag that signals whether the Ser-USB is currently performing serial I/O with the driver.

When used to try and set or clear the flag, UZ_BUSY will return 0 if the operation was a success, otherwise a QDOS error code ("In Use" if the flag was already set, "Already Exists" if the flag was already clear).

State% = 0 Try and clear the Ser-USB BUSY Flag.

State% = 1 Try and set the Ser-USB BUSY Flag.

State% = -1 Test the Ser-USB BUSY Flag, returning 1 if set or 0 if clear.

UZ_LOCK(State%)

If the Ser-USB Native Device Driver is installed, try to lock it so that FAT filing system operations can safely be performed.

If State% <> 0, try to lock the Ser-USB Native Driver.

If State% = 0, try to unlock the Ser-USB Native Driver.

If State% is omitted, test whether the driver is present by trying to lock, then unlock it. In which case a return value of either 1 or -9 should be expected if the driver *is* present, or -7 if it is not.

UZ_LOCK returns one of the following values:

0	Driver was successfully locked
1	Driver was successfully unlocked
-9 (err.iu)	Diver was already locked
-7 (err.nf)	The driver is not installed

UZ_GETLBAF(Drive, LBA, Buffer)

Read one LBA from the Ser-USB into memory.
Return 0 if success, else error code.

UZ_PUTLBAF(Drive, LBA, Buffer)

Write one LBA from memory to the Ser-USB.
Return 0 if success, else error code.

UZ_GETLBASF(Drive, LBA, Count, Buffer)

Read the contents of consecutive LBAs into memory from the Ser-USB.
Return 0 for success, else negative error code.

UZ_PUTLBASF(Drive, LBA, Count, Buffer)

Write the contents of memory into consecutive LBAs on the Ser-USB.
Return 0 for success, else negative error code.

UZ_BAUDF()

Return the current Ser-USB baud rate.

UZ_CHANNEL()

Return the current Ser-USB Channel ID.

UZ_PORT$()

Return the current Ser-USB port name.

UZ_ERROR$()

Return the last Ser-USB error response.

DATE_DOS$()

Return the current Date/Time as a DOS long word bit field represented by an 8 digit hex string.

DATE_DOS

Return the current Date/Time as a DOS long word bit field.

DOS_DATE$(DOSDate)

Convert a long word bit field DOS date to a string of the form "YYYY/MM/DD HH:MM:SS".

UZ_VARS([Offset%])

Return the base address of the Ser-USB FAT Driver variables.

Returns 0 if the driver variables could not be found; which almost certainly means that the driver has not been installed.

An optional integer offset may be passed to this function; this will be added to the return value and is a convenient way to get the address of a specific variable. If an offset is passed, it will be checked to ensure that it is the range allocated to the driver variables; an illegal offset will cause a Bad Parameter error.

UZ_HEAD(Address, Mode)

Check whether a file loaded in memory has a prefix header and return information from it.

This function would be useful to extract the header information from an executable file read from the Ser-USB with UZ_LBYTES or even to extract the header information from a file saved by Q-emuLator.

Mode = 0	Return 1 if a header was found at the start address, else 0
Mode = 1	Return the file type
Mode = 2	Return the file dataspace (if type 1)
Mode = 3	Return the file extra info
Mode = 4	Return the adjusted base address of the file contents (i.e. skip the header)

UZ_HEAD$(Type, Dataspace, ExtraInfo)

Construct a prefix header as a string.

This function creates a byte string containing a Q-emuLator-style prefix header constructed from the supplied values for file type, dataspace and extra information. The primary use of this function would be to create an executable binary file image before using UZ_SBYTES to save it to a file on the Ser-USB.

EOL_FIX$(Strings$)

Swap end of line characters in a string between CR (Ser-USB) and LF (QL).

Returns the adjusted string.

QL_DIR$

Return the current QL directory, or an empty string if it is not set. If a level 2 device driver is loaded, or Toolkit II is installed, this function is the same as DATAD$.

UZ_GET$([#Ch,]Count%)

Read up to Count% bytes from the file currently open on the specified channel on the Ser-USB.

UZ_SPOOLING()

Returns a bit field indicating the spooling status of the Driver Command Manager (DCM).

Bit 0	Set if the DCM is currently spooling to (or serving from) a file on the Ser-USB.
Bit 1	Set if the operation was initiated by the S*BASIC commands UZ_SPOOL or UZ_SERVE.

Returns 0 if no spooling is in progress.

UZ_SPL$

Returns a string suitable for use as the filename when opening a spool channel.

To use the UZ_SPOOL or UZ_SERVE commands a valid S*BASIC channel ID is required which is assigned to the Client Write pipe of the Driver Command Manager. This function returns a string that can be used with a file open statement to get a channel suitable for this purpose. In fact, it returns a filename that is guaranteed to be reserved for this purpose in all future versions of the driver.

Spooling And Serving

QDOS File System Operations

The Ser-USB FAT Driver implements some limited integration with the QDOS I/O Sub System, making it possible to open a file on the Ser-USB for Read or Write (but not both) with normal S*BASIC commands or from within a program. This can be done with a normal OPEN command to the UWZ device.

For example:

```
OPEN #3,'UWZ1_LIST.TXT'
```

will look for a file called LIST.TXT on the currently selected Ser-USB drive. If it exists, and it can be opened, the DCM is requested to start serving the file. From that point on any reads from that channel will be satisfied by the DCM. For this to work you must issue a UZ_DCMSTART command first (if you haven't already), as the software cannot automatically start the DCM from within the supervisor mode code of the device driver.

To open a file for writing you need to use OPEN_NEW or OPEN_OVER.

Also, the drive number after UWZ does not signify the drive on the Ser-USB. If you want to specify that the file is on a specific Ser-USB drive you must include a drive selector in the name:

```
OPEN #3,'UWZ1_2:MYLIST.BAS'
```

This command will look for the file MYLIST.BAS on the USB drive attached to USB port 1.

Because you can only open files on the Ser-USB for access in one direction (read **or** write) at any one time, it is also possible to force a specific open mode for the file, regardless of the mode setting which the program passes to the QDOS io.open call. To do this, suffix the filename with an @ sign followed by the mode (R = Read, W = Write, A = Append). For example:

```
OPEN #3,'UWZ1_2:MYLIST.BAS@W'
```

forces the file to be opened for writing.

The facility to integrate with the QDOS IOSS using spooling and serving is limited and cannot be guaranteed to work in all situations. For most operations, it will usually be better to use the native UZ_xxx commands and functions. Spooling and serving should be OK for programs that just do sequential reads or writes, but is likely to be problematic if the program does anything more sophisticated.

To reiterate: only one file may be open for spooling or serving at any time, and it can only be open for read **or** write; not both!

Anonymous Spool or Serve

To improve compatibility with some application programs (and many S*BASIC commands such as LOAD) you can use the Anonymous Spool or Serve mode. In this mode, the spooling or serving is started **before** any attempt to open the file. When this is done, the driver skips any processing to open or close the file.

To do this, issue a UZ_SPOOL or UZ_SERVE command **without** the channel number. The next attempt to open a file on the UWZ device will result in all read or write operations to be routed to the appropriate DCM channel.

Because, when using UZ_SERVE, the application program's requests are being routed through a pipe, it would have no way of knowing that End of File has been reached. To get around this problem, when the entire contents of the file have been served, the DCM waits five seconds before signalling that spooling has ended; this, in turn, causes the UWZ device driver to return EOF to the calling program. The relevance of all this being that there will be a delay of approximately five seconds after the last data is read from the file in this way, and the application program realising it!

Remember to issue a UZ_SERVE or UZ_SPOOL, with no parameters, when the file has been loaded or saved by the application program to ensure that all buffers have been flushed and to return the DCM to normal operation.

Here is an example of loading an S*BASIC program using anonymous serving:

```
UZ_SERVE "UWZ1_MYPROG.BAS" : LOAD "UWZ1_anything"
```

There will be about five seconds delay after the file has loaded before the cursor reappears. Then, issue the command:

```
UZ_SERVE
```

To stop the serving operation and release the DCM.

Notice that the UZ_SERVE and LOAD commands were placed on the same line. This is because the server will automatically close five seconds after the last data has been read from the input file. *In other words, to be safe, you must start reading from the served file within 5 seconds of starting the serve operation.*

Note that the filename passed to LOAD is irrelevant, although it must be a name that begins with "UWZ1_"; the actual file used is the one specified in the UZ_SERVE.

For information, the drive number after UWZ is currently ignored, but it is intended to signify individual Ser-USB devices - so UWZ2 would be a second Ser-USB attached to a different serial port. This functionality is, however, not yet implemented and the drive number is completely ignored. However, for compatibility with future software releases it should be restricted to '1'.

Driver Command Manager

Overview

The Driver Command Manager (DCM) is a background task that implements a pipe-based interface for accessing files on the Ser-USB, and provides spooling services for accessing files through native QDOS IOSS calls.

If you do not have a need to use Spooling and Serving (See the section *Spooling And Serving*) then you do not need to start the DCM.

Once started, the DCM uses two pipes for communication with the outside world. These are the Client Write Pipe and the Client Read Pipe. The protocol for communicating with the DCM is as follows:

- Client puts a command in the Client Write Pipe
- DCM reads and executes the command
- DCM puts a response in the Client Read Pipe (this can be zero for success, an error code, or some other response containing requested information)
- Client reads the response from the Client Read Pipe

An extended variation of this protocol is used for spooling and serving:

Client sends a File Open command to the DCM

If the response is OK then

Client sends a Spool or Serve command to the DCM

If the response is OK then

Client writes data to the Client Write Pipe (spooling)

or Client reads data from the Client Read Pipe (serving)

When finished, client signals completion by setting bit 0 of the DCM Flags byte

Client reads completion response to confirm signal caught

All DCM commands consist of a single byte, followed by zero, one or more parameters of variable length. When a parameter is a word or a long word, it is always sent most significant byte first (as are all DCM responses).

DCM Command Set

$00 [GDN] Get Device Name

Returns the name of the device as a four byte string. At present this always responds with 'UWZ0'.

$01 [GDV] Get Driver Version

Returns the version string of the Ser-USB FAT Driver as a four byte string "N.NN".

$02 [GHV] Get Hardware Version

Returns the firmware version of the USBWiz module inside the Ser-USB as a four byte string.

$03 [GHT] Get Hardware Type

Returns the type of hardware currently being used by the Ser-USB FAT Driver. Currently this will always return 'USBW' for USBWiz.

$04 [OF] Open File

Open a file on the Ser-USB.

Note: The relevant file system must have been previously mounted or this command will fail.

Takes:

Byte : Channel 0..3

Byte : Mode 'R','W','A'

Long : Pointer to filename

Returns:

Long : 0 for success, else error code

$05 [CF] Close File

Close a file currently open on the Ser-USB.

Takes:

Byte : Channel 0..3

Returns:

Long : 0 for success, else error code

$06 [WF] Write to File

Write to a file currently open on the Ser-USB.

Takes:

Byte : Channel 0..3

Long : Number of bytes to write

Long : Pointer to buffer

Returns:

Long : 0 for success, else error code

$07 [RF] Read from File

Read from a file currently open on the Ser-USB

Takes:

Byte : Channel 0..3

Word : Number of bytes to read

Returns:

Long : 0 for success, else error code

$08 [DF] Delete File

Delete a file on the Ser-USB.

Note: The relevant file system must have been previously mounted or this command will fail.

Takes:

Long : Pointer to filename

Returns:

Long : 0 for success, else error code

$0E [SRV] Serve

Serve the contents of the file currently open on the Ser-USB using the specified channel to the Client Read Pipe.

Takes:

Byte : Channel 0..3

Returns:

Long : 0 for success, else error code

$0F [SPL] Spool

Spools data from the Client Write Pipe to the file currently open on the Ser-USB using the specified channel.

Takes:

Byte : Channel 0..3

Returns:

Long : 0 for success, else error code

$C0 [SKE] Skip if Error

If the last command reported an error then skip the next n bytes as specified by the low nibble of the instruction.

1 <= n <= 15.

Takes:

Nothing

Returns:

Nothing

$D0 [RSKE] Report and Skip if Error

As Skip if Error, but also reports the error to the console.

Takes:

Nothing

Returns:

Nothing

$E0 [SKNX] Skip if No Extensions

As Skip if Error, but skips if the DCM does not support an extended command set.

At present, this command will always skip.

Takes:

Nothing

Returns:

Nothing

$F0 [NOP] No Operation

Performs no action; causes the DCM to read and execute the next command.

NOP is useful for aligning lists of commands sent to the DCM when you want to store word or long word values directly into the list before sending it.

Takes:

Nothing

Returns:

Nothing

$F1 [RLRC] Report Last Response to Console

Causes the response from the last command to be reported to S*BASIC channel #0, or to channel #1 if that is busy. This removes the response from the Client Read Pipe.

Takes:

Nothing

Returns:

Nothing

$F2 [RNRC] Report Next Response to Console

Signals that the next command should report its response to S*BASIC channel #0, or to channel #1 if that is busy, instead of putting it in the Client Read Pipe.

Takes:

Nothing

Returns:

Nothing

DCM Signals and Status

When running, the DCM continuously monitors its flag byte. This is located at offset $4b (75) from the base of the driver variables. The absolute address of the flag byte can be obtained with UZ_VARS(75).

The DCM will act upon the following flags (signals) if they are set to 1:

Bit 6	Stop the DCM
Bit 5	Flush the Client Read Pipe
Bit 4	Flush the Client Write Pipe
Bit 2	Report next response direct to console
Bit 0	Stop the DCM spooler/server

Once a signal has been acted upon, the bit is set to 0 by the DCM.

The DCM also reports its status through the flag byte:

Bit 7	DCM is running
Bit 3	Last DCM command reported an error
Bit 1	DCM is spooling

*DCM S*BASIC Interface*

It is possible to interact with the DCM from S*BASIC by using the UZC_xxx group of procedures and functions.

Note: These are not available until the DCM has been started with the UZ_DCMSTART command.

DCM Procedures

UZC_PUT Byte [,Byte]

Put one or more bytes into the DCM's command pipe.

UZC_CHREAD #Ch

Use an existing S*BASIC channel number to read from the DCM.

This converts a currently open channel number (which is closed first) into a channel to the Client Read Pipe.

DO NOT close this channel unless you set it to something else first, or you will close the pipe. (You can use the UZ_CHCHG command to do this).

UZC_CHWRITE #Ch

Use an existing S*BASIC channel number to write to the DCM.

This converts a currently open channel number (which is closed first) into a channel to the Client Write Pipe.

DO NOT close this channel unless you set it to something else first, or you will close the pipe. (You can use the UZ_CHCHG command to do this).

DCM Functions

UZC_STARTED()

Return 1 if the Driver Command Manager is running.

UZC_GET([Byte [,Byte]])

Get a long word command response from the driver's command pipe.

If parameters are supplied, send them to the DCM first by doing a UZC_PUT.

UZC_GET4$([Byte [,Byte]])

Get a long word command response from the driver's command pipe and return it as a string to S*BASIC. This can be used with DCM commands like GDV and GHV, for example.

If parameters are supplied, send them to the DCM first by doing a UZC_PUT.

UZC_GET$([Byte [,Byte]])

Get a string (terminated by newline) from the driver's command pipe.

If parameters are supplied, send them to the DCM first by doing a UZC_PUT.

UZC_PIPE_W()

Return the handle (QDOS channel ID) of the Client Write Pipe.

UZC_PIPE_R()

Return the handle (QDOS channel ID) of the Client Read Pipe.

The WINS Extension

The file wins_bin is a resident extension supplied with the Ser-USB driver that implements some window redefinition commands. These were originally derived from the WSET extension by Pedro Reina.

WINS adds three new commands to S*BASIC for setting the positions of the three windows to one of four pre-defined Window Sets, at the same time restoring the colours and borders to the QL defaults.

IMPORTANT: WINS does NOT change the display mode and you cannot configure the colours and borders.

Installation

Load WINS like any other resident extension, either with a RESPR/LBYTES/CALL sequence or with Toolkit II's LRESPR command (or equivalent).

Usage

WINS [Window Set]

Sets the windows according to the specified Window Set definition. WINS comes configured with Sets 0 and 1 being equivalent to the QL's default Monitor and TV windows. Set 2 is configured for an LCD TV connected to the QL through an RGB to SCART lead. Set 3 is for an LCD monitor in SVGA mode connected to an Aurora replacement QL mainboard. (Note that sets 2 and 3 are unlikely to be perfect matches for all makes of hardware but should prove useful as starting points - see below for instructions on how to customise the Window Sets).

If no Window Set number is supplied then the set number specified in the Level 1 Config Block will be used.

WIN0 [Window Set]

Sets window #0 to full screen, according to the definition in the specified Window Set.

SRU_WINS

This is a special command that works with Memory Lane Computing's Ser-USB 2.0 Legacy Driver ROM. If that driver is loaded from the startup screen, it has to open a channel to the serial port before all of the S*BASIC windows have been opened. This means that S*BASIC window #1 has a different channel number to that which it is normally mapped to after a boot. Some software (even most QL ROM versions) make the assumption that the first three channels in the system will always be the same. SRU_WINS tries to restore this situation by manipulating the QDOS and S*BASIC channel tables, swapping the Ser-USB channel ID so that the channel tables are left looking like they do after a normal boot. It then does a WINS command to apply the configured Window Set definition.

If you issue the SRU_WINS command on a machine without the Ser-USB driver, or the channel tables are found to be correct or cannot be adjusted, then this command is the same as issuing WINS without a parameter.

WINS could be incorporated into the boot file of a Ser-USB drive like this:

```
100 a= RESPR(1000)
110 LBYTES 'sru1_wins_bin',a
120 CALL a
130 SRU_WINS
```

Note that you can only include line 130, and have the channels fixed and windows set automatically, if your ROM is JS or later. With JM you will either have to chain to another program that includes SRU_WINS or you will have to manually issue the command. This is because early QDOS versions do not install extensions in such a way that they overwrite any existing definitions with the same name (so it looks, instead, for an S*BASIC PROCedure called SRU_WINS).

Configuration

WINS has an embedded Level 1 Config Block, but this can only be used to configure which Window Set is used when the WINS or WIN0 commands are used without a parameter. In order to change the Window Set definitions it is necessary to load the file wins_bin into a binary editor (such as the Master Spy).

To find the Window Set definitions, search for the byte string: 02 00 01 00 00 00 00 00. In WINS v1.02 this is at offset 0x2DA. The Window Set definitions are located eight bytes further on (offset 0x2E2 in v1.02).

Each set has four window blocks, each containing four word-sized values for Width, Height, X Origin and Y Origin. The four window blocks define S*BASIC windows in this order:

a) #0

b) A full screen version of #0 (that can be set by the WIN0 command)

c) #1

d) #2

The relative offsets of the Window Sets and their components are listed below. These start at the address found above.

Window Set 0

Window #0
000 Width
002 Height
004 X Origin
006 Y Origin

Window #0 Full Screen
008 Width
010 Height
012 X Origin
014 Y Origin

Window #1
016 Width
018 Height
020 X Origin
022 Y Origin

Window #2
024 Width
026 Height
028 X Origin
030 Y Origin

Window Set 1

Window #0
032 Width
034 Height
036 X Origin
038 Y Origin

Window #0 Full Screen
040 Width
042 Height
044 X Origin
046 Y Origin

Window #1
048 Width
050 Height
052 X Origin
054 Y Origin

Window #2
056 Width
058 Height
060 X Origin
062 Y Origin

Window Set 2

Window #0
064 Width
066 Height
068 X Origin
070 Y Origin

Window #0 Full Screen
072 Width
074 Height
076 X Origin
078 Y Origin

Window #1
080 Width
082 Height
084 X Origin
086 Y Origin

Window #2
088 Width
090 Height
092 X Origin
094 Y Origin

Window Set 3

Window #0

096	Width
098	Height
100	X Origin
102	Y Origin

Window #0 Full Screen

104	Width
106	Height
108	X Origin
110	Y Origin

Window #1

112	Width
114	Height
116	X Origin
118	Y Origin

Window #2

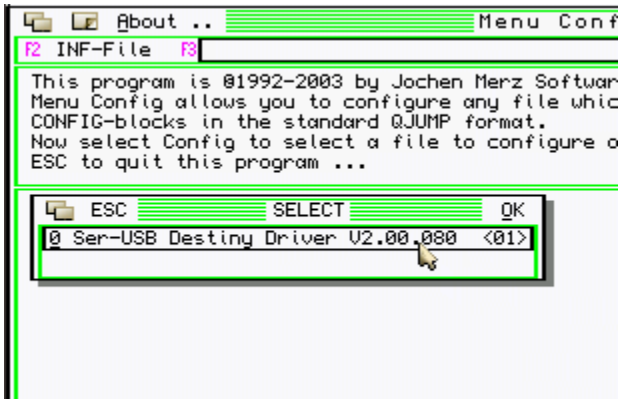
120	Width
122	Height
124	X Origin
126	Y Origin

Configuring the Driver

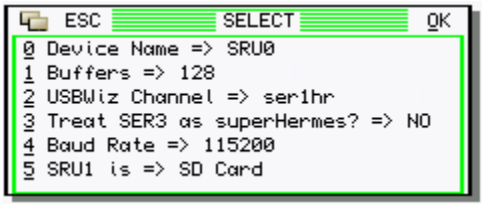
Because the Ser-USB is connected to a serial port, and not all systems will use the same serial port at the same speed, it may be necessary to configure the driver for your requirements. The RAM drivers (Destiny, Legacy and FAT) all contain standard QJump Level 1 Config Blocks that can be configured with the free MenuConfig program. The ROM drivers do not include Config Blocks to save space and so must be configured by patching the binary file directly. This section contains instructions for all drivers and variations.

Ser-USB Destiny RAM Driver

Load the file serusb2_bin into MenuConfig and choose the Config option:



There is only one Config Block, so select it:



There are five items which can be configured:

Device Name

The name of the Ser-USB device is normally SRU. If this causes problems on your system, or you wish to change it for some other reason, you may alter the name of the device to any three characters. These must be upper case, and the fourth character must always be a zero.

Buffers

EDDE 2 drivers do not use the QDOS/SMS Slave Block system. Instead they allocate their own private slave blocks which are strictly limited to a configured maximum to avoid all available RAM being taken up by them. You may enter a value between 0 and 2048, but the EDDE 2 core will automatically scale back that value if it would take an excessive amount of RAM. A value of 0 causes the EDDE 2 core to allocate the most appropriate number for the amount of RAM in the system.

USBWiz Channel

The full name of the serial port over which the Ser-USB driver will communicate with the Ser-USB.

Treat SER3 as superHermes

This setting is intended for use when the Destiny Driver is used with future hardware. It is not needed for use with a QL emulator and should be left set to NO.

Baud Rate

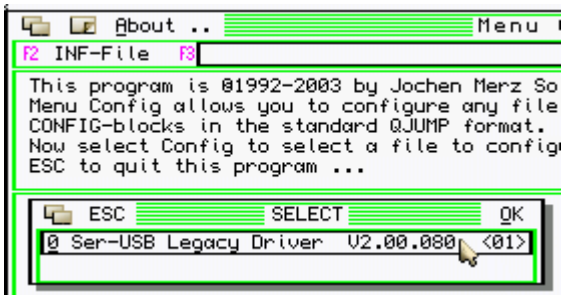
The baud rate which the driver will use to connect to the Ser-USB. 115200 will usually be perfectly reliable when using a QL emulator.

SRU1 is

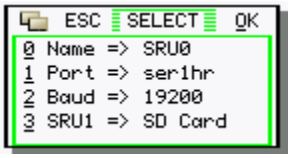
Choose which drive to be mounted as SRU1. The pop-up list allows you to select from the SD Card or USB Ports 1 and 2.

Ser-USB Legacy RAM Driver

Load the file serusb2L_RAM_bin into MenuConfig and choose the Config option:



There is only one Config Block, so select it:



Name

The name of the Ser-USB device is normally SRU. If this causes problems on your system, or you wish to change it for some other reason, you may alter the name of the device to any three characters. These must be upper case, and the fourth character must always be a zero.

Port

The full name of the serial port over which the Ser-USB driver will communicate with the Ser-USB.

Baud

The baud rate which the driver will use to connect to the Ser-USB. 115200 will usually be perfectly reliable when using a QL emulator.

SRU1

Choose which drive to be mounted as SRU1. The pop-up list allows you to select from the SD Card or USB Ports 1 and 2.

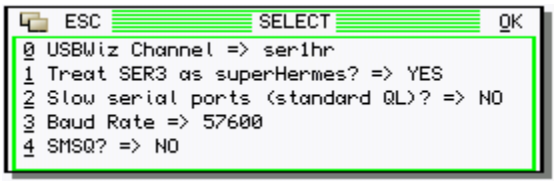
Notes:

- The Legacy Driver has no option for configuring the number of buffers as the driver automatically determines the appropriate number to use depending upon the amount of available RAM.
- The Legacy Driver always treats SER3 as superHermes.

Ser-USB FAT RAM Driver

Load the file usbwiz_RAM_bin into MenuConfig and choose the Config option:

There is only one Config Block, so select it:



USBWiz Channel

The full name of the serial port over which the Ser-USB driver will communicate with the Ser-USB.

Treat SER3 as superHermes

Valid only if the FAT driver is loaded standalone (without having loaded the Native driver first). If the port name is set to SER3 assume that this is the superHermes fast serial port.

Slow serial ports (standard QL)?

Valid only if the FAT driver is loaded standalone (without having loaded the Native driver first). Signal that the driver is being loaded on a standard QL without serial port enhancements such as Hermes or superHermes.

Baud Rate

The baud rate which the driver will use to connect to the Ser-USB. 115200 will usually be perfectly reliable when using a QL emulator.

SMSQ?

Use SMSQ enhancements, if available.

Ser-USB Legacy ROM Driver

Open the ROM image in an editor capable of non-destructively editing binary files (Master Spy, for example).

Search for the string "CFG=" (without the quotes).

Immediately following that string are the configuration items:

+0 : USBWiz Port Name (Length word followed by a maximum of 6 characters)

+8 : Baud Rate (Byte in the range 0 to 6)

0 = 4800

1 = 9600

2 = 19200

3 = 38400

4 = 57600

5 = 115200

6 = 230400

+10 : Name of the device (Length word, which must be 4, followed by 4 characters)

+16 : Drive to mount as SRU1 (Byte in the range 0 to 3)

0 = Nothing

1 = SD Card

2 = USB Port 1

3 = USB Port 2

Pre-configured versions for SER1/SER2 are supplied in the distribution. A standalone config utility may be released later if there is sufficient demand.

Ser-USB FAT ROM Driver

Open the ROM image in an editor capable of non-destructively editing binary files (Master Spy, for example).

Search for the string "CFG=" (without the quotes).

Immediately following that string are the configuration items:

+0 : USBWiz Port Name (Length word followed by a maximum of 6 characters)

+8 : Baud Rate (Byte in the range 0 to 6)

0 = 4800

1 = 9600

2 = 19200

3 = 38400

4 = 57600

5 = 115200

6 = 230400

Pre-configured versions for SER1/SER2 are supplied in the distribution. A standalone config utility may be released later if there is sufficient demand.

Troubleshooting

Although a huge amount of work has gone into developing the Ser-USB driver, and it is believed to be working correctly, it is impossible to test it under every possible combination of hardware and software. Just for starters, there are several revisions of the basic QL ROMs (AH, JM, JS, MG et al) as well as Minerva and SMSQ to consider, not to mention any number of different hardware platforms (Aurora, Gold Card, Super Gold Card, QXL etc).

If you encounter a problem which you cannot solve using this section of the manual please contact Memory Lane Computing for assistance.

Common Problems

Ser-USB won't handshake

The most critical phase of the driver initialisation is to handshake the Ser-USB; to establish the two way serial communications channel between the QL and the USBWiz module in the Ser-USB unit.

The initial communication **must** take place at 9600 baud. If, for some reason, the USBWiz module is not using 9600 baud then the handshake will fail. This is only likely to happen if you have previously set a higher baud rate and then rebooted the QL, but not reset the Ser-USB.

Note that the 9600 baud initial dialogue poses a real problem for a standard QL without superHermes because the QL needs two stop bits to be able to receive at 9600 baud and the USBWiz module only sends one. The Ser-USB driver thus changes baud rate "blind" and sometimes this process may fail.

Solution: Try rebooting, resetting the Ser-USB and then re-loading the driver. Normally, you should until after the QL has cleared the screen of the tweed pattern caused by the RAM test before pressing the Ser-USB's reset button.

Illustration 22: The Ser-USB Reset Button

Ser-USB times out

If at any point during an I/O operation the Ser-USB stops responding then the QL is very likely to hang. Some sections of the driver are capable of recovering from this critical error, but this recovery is incomplete and may still lead to a crash.

Solution: Wait for at least five minutes before assuming that all is lost. The driver uses very long timeouts to ensure that all the data is transferred on slow systems, so it might still recover. If it doesn't, then the only option is to reset both the QL and the Ser-USB.

If this keeps happening, try using a lower baud rate. 57600 should be reliable with superHermes but, if not, try dropping it to 38400.

Drive 0 not found

Some SD cards don't like being in the USBWiz module when it is powered up. If this happens the driver cannot mount the card.

A symptom of this is that initial handshaking will succeed, but after the message "Loading and checking the FAT" the message "Drive 0 not found!" is displayed.

This error will also be displayed if the drive has not yet been formatted.

Solution: If the drive is formatted as a QDOS volume and the error occurs, remove the SD card from the slot, re-insert the SD card, wait 5 seconds, then issue a **MOUNT** command to mount the card.

If the drive is not formatted, issue a **FORMAT** command to get the drive into a state that the Ser-USB driver can use.

In Use

If you see this error in response to any command when accessing the Ser-USB it means that one of the lock flags that the I/O Servicer Lock is set. The driver is servicing a trap #2 or trap #3 request and hasn't completed. No further traps can be serviced until the I/O Servicer lock is cleared.

This can happen if more than one process tries to access the SRU device at the same time, but most likely it's a bug and should be reported.

Bad or Changed Medium

The USBWiz module has not returned the expected response from a command to mount a drive for direct access

or

an attempt to read a sector from the drive has failed.

Solution: Restart and try again. If the problem persists, try a different drive. SD cards (especially older ones) are more prone to this problem than USB hard drives.

Not Found

An attempt to mount a physical drive has failed because there is no drive attached to the specified port.

or

a critical driver component is missing, which probably means that system memory has been corrupted and the OS is going to crash in the very near future!

Solutions: Attach the required drive or restart.

Uncommon problems

Data corruption

Because the USBWiz module is handling the actual writes to the storage media, data corruption is rare. If it does happen, and it wasn't preceded by the Ser-USB hanging up or QDOS crashing, then it indicates a critical driver-level error that has gone untrapped.

Solution: Contact Memory Lane Computing for assistance. Try to gather as much information as possible about the circumstances in which the corruption occurred.

IMPORTANT: If the directory appears to be corrupted, do not under any circumstances write to the drive. Try and copy the data off to another device. Continuing to write to a drive with a corrupted map WILL result in irretrievable data loss!

DO NOT try to access partitions greater than 1 that were created with an earlier version of the Partition Manager. Versions prior to 2.0 improperly set the value of the start LBA to a value scaled in groups. Recreate these partitions again using PM 2.0 or higher.

Application crashes and hangs

Ser-USB is a standard QDOS directory device and so should be compatible with all well written software. However, because of its single-threaded, non re-entrant nature, there may be some software which fails when using the Ser-USB. In particular, applications that perform data-intensive processing or open and close lots of files in succession are unlikely to work reliably.

Solution: Contact Memory Lane Computing for assistance. Try to gather as much information as possible about the circumstances in which the crash occurred.

Rom Driver Supplement

The Ser-USB Legacy and FAT Drivers are also available on a ROM Card (current versions of the card are also switchable between Native and FAT drivers). This is extremely useful when you want to move the Ser-USB between several different machines. However, although you don't need a floppy drive to load the driver, you will still need expanded memory on the QL to run it. This is because of the amount of RAM that is needed to hold the FAT and buffers (a limitation that also applies to hard disk drivers).

Illustration 23: The Ser-USB ROM Card

Ser-USB Legacy Native Driver ROM

The Native ROM driver will try and connect to the Ser-USB as soon as the QL is started and will load and run a BOOT file if one is found.

If this is not what you want to happen then you have the option to press any key within 1.5 seconds of the following message appearing on the startup screen:

```
Press any key in 1.5s to abort load
```

If you hit a key in time, this message will be displayed:

```
Load driver with SRU_START command
```

The QL can then be booted as normal by pressing F1 or F2. If you then wish to load the Ser-USB driver at a later time, you must use the SRU_START command.

The Ser-USB Legacy Driver ROM startup screen will look something like this:

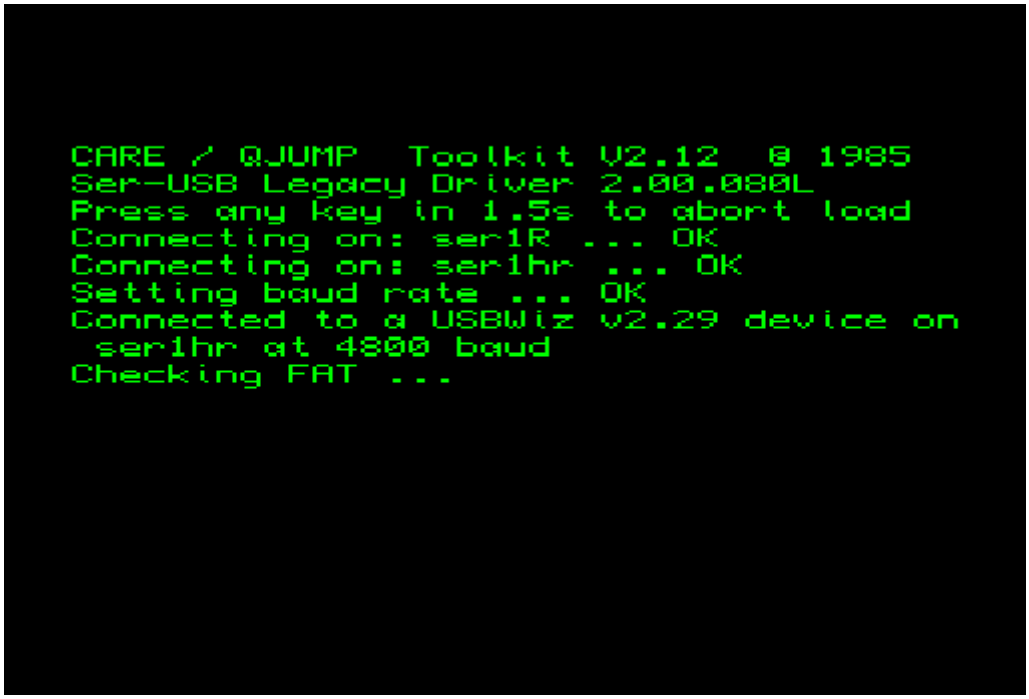


Illustration 24: Ser-USB Legacy ROM Startup Screen

After the FAT has been checked you will be able to start the QL as normal:

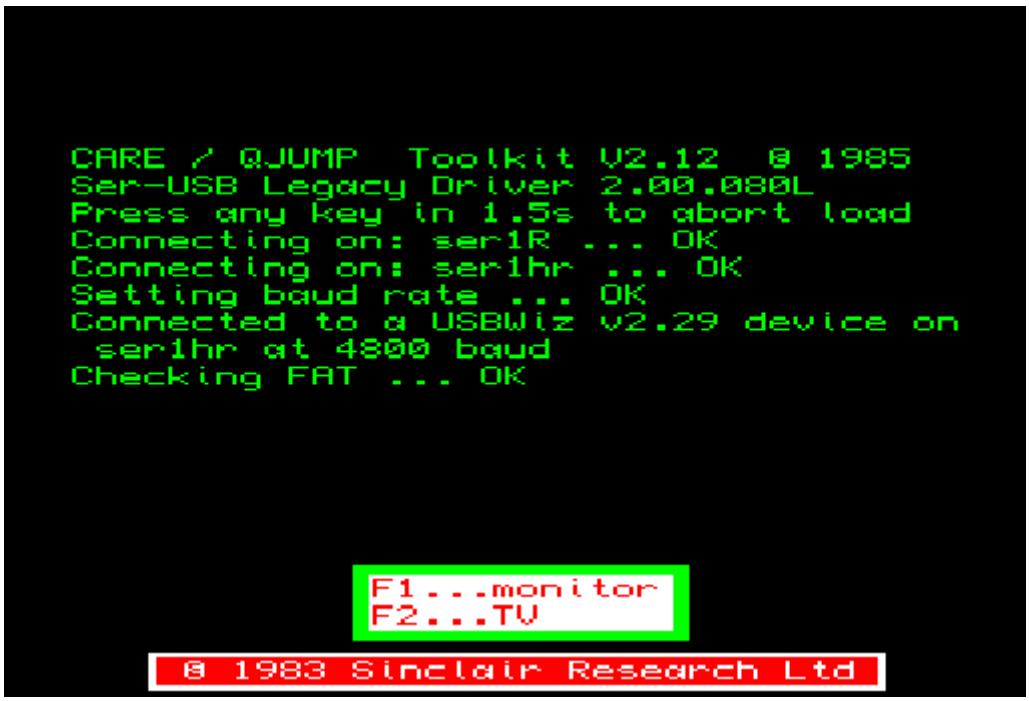


Illustration 25: Ser-USB Legacy ROM loading completed

Pressing F1/F2 at this point will run a BOOT program is one is found on the drive. However, due to a QDOS limitation, the channels will not be the same as on a normal QL start, and this may affect the BOOT program. See the section *Native ROM Driver Issues* for more details on this problem and how to fix it.

SRU_START [LParam]

SRU_START is the command provided to start the Ser-USB native driver if you chose to abort loading at the startup screen.

Note: This command is NOT present in the Native RAM driver.

LParam is a long integer value consisting of baud rate + port number. If omitted the settings as configured will be used (normally ser1hr @ 4800 baud).

Examples:

SRU_START 4801 (or SRU_START 4800)

Start the driver using SER1 @ 4800 baud. This is the normal setting for a standard QL without enhanced serial hardware.

SRU_START 19202

Start the driver using SER2 @ 19200 baud. This requires the presence of a Hermes or superHermes.

SRU_START 57603

Start the driver using SER3 @ 57600 baud. This requires the presence of a superHermes.

Ser-USB FAT Driver ROM

The Ser-USB FAT Driver ROM does not try to establish a connection to the Ser-USB when the QL starts up. Instead, it provides the UWZ_START command.

UWZ_START [LParam]

In all respects this command is identical to the native driver's SRU_START command.

Note: This command is NOT present in the FAT RAM driver.

LParam is a long integer value consisting of baud rate + port number. If omitted the settings as configured will be used (normally ser1hr @ 4800 baud).

Examples:

UWZ_START 4801 (or UWZ_START 4800)

Start the driver using SER1 @ 4800 baud. This is the normal setting for a standard QL without enhanced serial hardware.

UWZ_START 19202

Start the driver using SER2 @ 19200 baud. This requires the presence of a Hermes or superHermes.

UWZ_START 57603

Start the driver using SER3 @ 57600 baud. This requires the presence of a superHermes.

Known Issues

This is a list of the issues that were known at the time of writing.

Native RAM Driver Issues

- You cannot copy files between Ser-USB drives. (e.g. wcopy sru1_,sru2_).
- Application programs that attempt to perform trap #2/trap #3 calls with the Ser-USB Legacy Driver whilst in supervisor mode will fail.
- The QPAC Files Thing does not work.
- WCOPY and its derivatives **may** fail when copying large numbers of files. This problem may cause an inexplicable "Not found" error, a repeat of the "Y/N/A/Q?" prompt or garbled filenames. If it happens, abort and reboot.
- Partitions that require group sizes larger than 2 degrade performance and have been shown to cause system crashes on **some** systems. The reason for these crashes was not known at the time of writing. Test large partitions thoroughly on your system before using them for important data. Better still, stick to partitions of 5 to 10 MB and use more of them instead of one large partition.

FAT Driver Issues

- UZ_EX and UZ_EW cannot be used to execute programs that make assumptions about the ordering and relative positions of the header, code and data areas. Instead load the supplied uzx_bin extension which implements alternative commands for starting problem programs.

Native ROM Driver Issues

On ROMs other than Minerva, S*BASIC window #1 will appear with the size and position of the window used to display the copyright message on the startup screen. This is because the ROM code makes assumptions about channel numbers that don't hold true if a serial channel was opened to load the Ser-USB driver during QDOS initialisation.

With ROMs other than Minerva, the screen will look like something this after loading the ROM driver:

Illustration 25: Ser-USB Legacy ROM loading completed

This shows the screen after pressing F1. Pressing F2 will obviously give a different result, but the problem is the same.

This cannot be fixed in the driver, so the solution is to either to use Toolkit II's WMON command or similar, which puts the windows in the right position (but leaves the QDOS channel numbers as they are), or ...

... use the supplied WINS extension. This is a RESPR file that installs commands for quickly setting all three S*BASIC windows according to one of four pre-defined sets of positions/sizes. This extension includes the command SRU_WINS which directly manipulates the QDOS and S*BASIC channel tables, returning things to the way they normally are after the machine has started up. See the section *The WINS Extension* for more details.

Changes from the 1.x Drivers

There are too many changes to list them all here, so here are the most important ones:

- IMPORTANT: The device name has changed from USB to **SRU** (i.e. USB1_ is now **SRU1**_).
- VERY IMPORTANT: DO NOT try and mount a partition, other than the first one on a card or disk, with a 1.x driver if you have written to it using a 2.x driver. Although the formats are identical, the 2.x series of drivers fix a bug in the format of a field in the partition header, rendering it incompatible with the earlier drivers. A 1.x driver will probably report that the FAT is invalid if this happens, but it may not detect the problem, leading to unpredictable data corruption.
- The driver core is now EDDE 2 with many bug fixes and enhancements. This renders ALL previous Ser-USB driver extensions and tools inoperable (but replacements are available).
- Write As You Go (WAYG) map handling. This removes the irritating delayed-action map flush that brought the system to a halt for long periods of time.
- The Queue Manager is no longer required (or supported).
- Tighter IOSS retry integration means that QDOS is handling the retry of serial I/O operations and not the driver. This improves overall reliability.
- The ROM driver does not need to load any overlays.
- The ROM driver allows the QL to boot from a Ser-USB drive.
- The ROM driver presents an option at the QL startup screen to either automatically start the driver or to manually start it with the SRU_START command.
- Updated S*BASIC procedures and functions.
- Changes to the way that FORMAT is implemented. In particular, a new command SRU_FORMAT for the legacy driver.
- API system replaced by a separate EDDE2 Link Layer Driver.

Appendix 1: The Ser-USB ROM Card

Illustration 26: The Ser-USB ROM Card

Background

The Ser-USB ROM Card is a small circuit board that plugs into the ROM socket on the back of the QL. Depending upon the availability of memory chips at the time of production it contains either a 32Kbyte EPROM or a 64Kbyte OTPROM (One Time Programmable Read Only Memory).

As new EPROMS are very difficult to source nowadays, the chips used will normally be recycled from old equipment whereas OTPROMs are always new stock.

Instructions for Use

The Ser-USB ROM Card is used just like a QL ROM cartridge. The card should be inserted into the ROM socket (with the power switched **OFF!**), with the chips facing upwards.

We tried to keep the size of this card as close to the original dimensions of the common QL ROM cartridges as possible, whilst still squeezing in new functionality. This means that, when the card is inserted, about one millimetre along the edge of the EPROM will be in contact with the lid of the QL, and it may look as if the card has not gone all the way in. This is normal: please do not try and force the card any further into the socket or you may damage it. When the card is correctly inserted it looks like this:

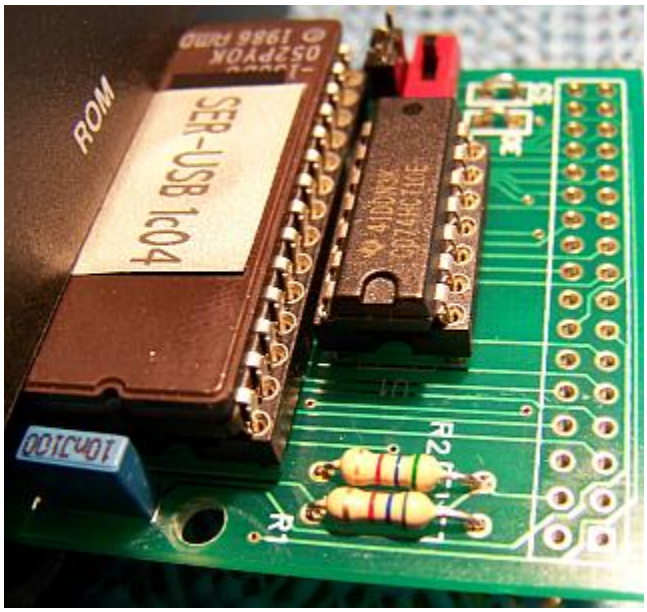


Illustration 27: Ser-USB ROM Card correctly inserted

Referring to illustration 26 (The Ser-USB ROM Card), the slide switch to the left of the small integrated circuit selects which driver you wish to have available. When the switch is moved to the left, the Ser-USB Native Driver will be available; when moved to the right, the Ser-USB FAT Driver can be used.

You must not move the switch while the QL is running, or the system will crash. To change the driver, either switch off the QL, move the switch, then turn the QL back on again, or: Press and hold the QL's reset button, keep it pressed while you slide the switch to its new position, then release it. The QL will now boot with the selected driver available, as should be illustrated by the banner message that appears on the F1/F2 startup screen.

You will notice a small jumper below the slide switch, labelled A15. This is for selecting the upper 32Kbytes of a 64Kbyte EPROM or OTPROM. With the jumper on the right hand pair of pins, the lower 32K is selected; moving the jumper to the left hand side will allow the upper 32Kbytes to be selected - in which case the slide switch switches between the upper two 16Kbyte blocks of the ROM's address space. This function is reserved for future expansion but, obviously, with the right chip, you could use it to have up to four ROM images on the card, selectable by switch and jumper as needed.

Finally, there are two wire links above the switch, labelled CS and OE. These connectors are intended to be used with additional hardware for software-controlled ROM paging and are provided only for future product developments. If you cut these jumpers the card will stop working!

Please refer to the instructions earlier in this user guide for instructions to load and use the driver.

The Expansion Connector

At the opposite end to the QL side of the card are two rows of plated through connector holes; these are designed to take a 34 pin box header. All of the QL's ROM socket lines are brought out to this connector using the same pin configuration as the Aurora card's ROM connector:

1 N/C	2 N/C
3 N/C	4 +5V
5 A12	6 A14
7 A7	8 A13
9 A6	10 A8
11 A5	12 A9
13 N/C	14 N/C
15 A4	16 A11
17 A3	18 ROE
19 A2	20 A10
21 A1	22 A15
23 A0	24 D7
25 D0	26 D6
27 D1	28 D5
29 D2	30 D4
31 GND	32 D3
33 N/C	34 N/C

Note: Pin 1 of this connector is the hole with a square pad.

Notes and Other Information

When used with standard QL serial port hardware and/or an unexpanded QL we recommend that you use the FAT driver. The FAT Driver uses less memory and performs all filing system management on the USBWiz device.

Due to the design of the QL hardware, if the ROM Card is plugged into an unexpanded QL the ROM banner message may be repeated twice on the QL's initial F1/F2 screen. This is due to incomplete address decoding in the QL design itself. The problem is fixed if you have a Minerva ROM. It *could* be fixed in software within the Ser-USB ROM but this would require extra space which we would prefer to use for the driver itself.

Acknowledgements

The EDDE 2 core used by the Ser-USB Native Driver was originally derived from v2.02 of the QUBIDE hard disk driver written by Andrew Reed and Phil Borman. Without this driver to use as a base, Ser-USB would not have happened.

As this QUBIDE version was released under the GPL, the core code for the EDDE 2 driver is also covered by the terms of the GPL and will be made open source as soon as beta testing is completed successfully.

The latest source can normally be obtained from the same place that holds this manual, or it can be found at the Memory Lane Computing web site: www.memorylanecomputing.com.

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They are intended to be used with a Ser-USB unit, but permission is hereby granted to use a copy of this software with any other hardware that connects a USBWiz to the QL, provided that full acknowledgement is given and that the software is not modified in any way (other than by changing the user configurable settings in the embedded configuration blocks).

DISCLAIMER

Whilst Memory Lane Computing believe this manual to be accurate and the software to be free from significant errors, no responsibility is accepted for the loss of data or consequent damage of any kind resulting from the use of this product.

That said, we will use our best endeavours to correct any technical faults that are identified and to issue updated software releases where this is required and feasible.

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