uMMC Serial Data Storage Module User Manual

Features

Features	
Card Types	SD/miniSD/microSD
Card Format	MMC/SD/SDHC
Card Sizes	8MB → 32GB
File Systems	FAT12 FAT16 FAT32
Control Interface	TTL Serial
Serial Interface	8 bits, no parity, 1 stop bit
Serial Speeds	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800 bps
Operating Temperature	-40°C to +85°C
Physical Size	2×1.25 inches (50.8×31.75 mm)
Power Source	3 → 5 Volts
Chipset Available	Yes - 44 lead TQFP, or 44 pad QFN

Overview

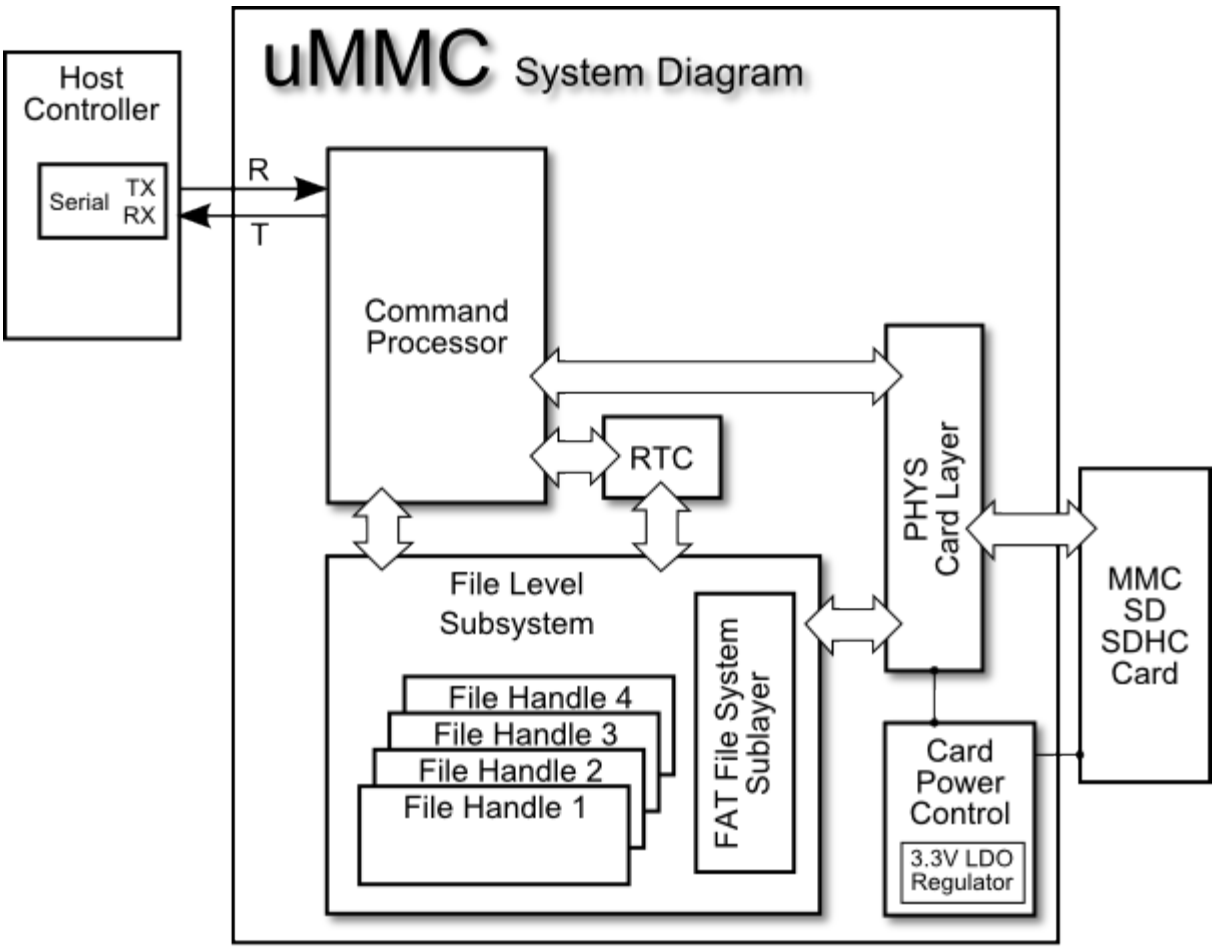
- Supports
  - MMC, SDC, SDHC card formats.
    - All available card formats are supported. From 8MB up to 32GB.
  - FAT12, FAT16 and FAT32.
  - Long file names.
  - SD, miniSD, and microSD form factors.

- TTL serial host connection from 2400 → 460800 bps.
- Up to 4 file handles open simultaneously for reading and/or writing.
- Random reads/writes.
  - You can read from or write to anywhere in a file.
  - Seeking in a file allows for file pre-allocation, leading to faster write times.
- File truncation.
- Change file modification stamp.
- Change file attributes.
- Iterated file listings with wildcards.
  - You can iterate through a directory listing with wildcards.
- Direct file copy.
  - Copy data from one file to another directly.
- On-board Real-Time Clock (RTC).

    - Files created/modified have time stamps updated to current time.[1)]
- Configuration on card.
    - Settings can be read from a configuration file on the card.[2)]
- Chipset available for OEM integration. Single TQFP or QFN component.
- -40°C to +85°C operating temperature range.
- RoHS compliant.

[1)] Time must be set after power-up.
[2)] On power-up only.

System Diagram



Specifications and Standards

Electrical Characteristics

Absolute Maximum Ratings

Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +150°C

Voltage on any pin	-0.5V to Vcc+0.5V
Maximum Operating Voltage	6.0V

WARNING Exceeding values beyond these **absolute maximum** values may cause permanent damage to the device and/or card! Operating at **absolute maximum** rating conditions for extended periods may affect device and/or card reliability.

DC Characteristics

Parameter	Min	Typ	Max	Units
Power Supply Current				
Icc: Idle, Vcc=5V, No card		11	15	mA
Icc: Idle, Vcc=3V, No card		5.5	8	mA
Icc: Idle, Vcc=5V, w/card		12	40+ [1)]	mA
Icc: Idle, Vcc=3V, w/card		6	30+ [2)]	mA
Icc: Active (R/W), Vcc=5V		25	250 [3)4)]	mA
Logic Input Low	-0.5		0.2 Vcc [5)]	V
Logic Input High	0.6 Vcc [6)]			V
Logic Output Low @ Vcc=5V			0.7	V
Logic Output Low @ Vcc=3V			0.5	V
Logic Output High @ Vcc=5V	4.0			V
Logic Output High @ Vcc=3V	2.2			V

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1), **2)**, **3)** Because card active and idle current values vary widely from brand to brand, a maximum cannot be determined. Please refer to your card manufacturers specifications for read/write current consumption values.

4) This is the maximum current that the on-board LDO regulator will supply. Cards that require more power than this are not supported.

5) “Max” means the highest value where the pin is guaranteed to be read as low.

6) “Min” means the lowest value where the pin is guaranteed to be read as high.

Timing Characteristics

Parameter	Min	Typ	Max	Units
Serial Speed	2400		460800	bps
Power up delay: no card			200	ms
Power up delay: w/card	200	250	400+	ms
Card initialization time [1)]	30	80	200+ [2)]	ms

---

2) Card communication timing will vary widely from brand to brand depending on many factors.

1) This is the amount of time taken to initialize a card after insertion and a command has been sent, but before the command has been executed.

Communications Protocol

Description

The Protocol for the uMMC employs a simple but robust asynchronous serial control protocol. A command prompt ”>” (“greater than” symbol, ASCII 62, HEX 0x3E) indicates that the uMMC is ready to accept a command. A command can be sent, a response will be returned, and the command prompt will be sent again.

Example:

F«cr»
1>

If an error occurs while processing a command, an error is returned in the format ”`Enn`”. See the table of error codes.

Example:

>O 1 R /LOGS/2004/FEBRUARY/FEB30.LOG«cr»
EF2>

Command Format

`C«sp»Parameter1«sp»Parameter2«sp»…«cr»`

Where:

- `C` is a single command character.
- `«sp»` is a single space character (ASCII 32, HEX 0x20).
- `Parameter1`, `Parameter2`, ... are parameters associated with the command
- `«cr»` is a carriage return character (ASCII 13, HEX 0x0d)

Command Listing Format

```
C Parameter1 [Parameter2 [Parameter3]]…
```

- `C` is the command character. A single character.
- `Parameter1` is the first parameter for the command.
- `Parameter2` is the second parameter for the command. If it is listed inside of square brackets [ ] then the parameter is optional.

Any parameters listed inside of square brackets [ ] are optional. Most commands that have optional parameters will require the previous parameter to be given.

Command Response Format

In general, responses are of the format:

```
[[«sp»][data]] | [Enn]
```

Error codes are returned as `Enn`, where `nn` is a hexadecimal code indicating the error. See the table of error codes.

Command Set

Set Attributes

Description

Change the attributes of a file.

In the FAT file system, there are 4 attributes which can be set:

- A = Archive
- H = Hidden
- R = Read Only
- S = System

Note

You can not combine adding and removing of attributes in a single command. i.e. you must only add or only remove attributes per command.

Format

`A +|- attribute path`

Parameters

- *`attribute`* is one or more of “R”, “H”, “S”, or “A”.
- *`path`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
    - e.g. `/logs/january/jan3.log`

Response Format

`NULL` | Enn

Example

To set “read-only” attribute for a file:

```
A +R /filename.txt
```

To remove “hidden” and “system” attributes for a file:

```
A -HS /filename.txt
```

Copy

Description

This command will copy data from an open file to another open file. Requirements: Two files must be open, one for reading, and the second for writing. e.g.

```
O 1 R /sourcefile.txt
O 2 RW /destfile.txt
```

Copy File will copy from the current location in the source file, up to “num” bytes if specified, to the destination file (starting at the destination's current location).

Note

You can interrupt the transfer at any time by sending «ESC» (ASCII 27, HEX 0x1B).

Format

`B fh1 fh2 [num]`

Parameters

- *fh1/fh2* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.
- *num* is the number of bytes to copy from *fh1* to *fh2*. If *num* is not given, or is greater than the size of *fh1*, then the entire contents of *fh1* is copied.

Response Format

NULL | *response* | Enn

response depends on the C setting shown below.

C = 0:

NULL

C = 1:

```
#########...####
```

C = 2:

```
nn..nn bytes copied at r..rr bytes/second
```

C = 3:

```
#####...####nn..nn bytes copied at r..rr bytes/second
```

Example

To copy 200 bytes from the current location of handle 1 to handle 2:

```
B 1 2 200
```

To copy the entire source file to the destination file:

```
O 1 R /sourcefile.txt
O 2 RW /destfile.txt
B 1 2
```

To copy 600 bytes from position 12000 of handle 1, to handle 3, starting at position 50000:

```
O 1 R /sourcefile.txt
O 3 RW /destfile.txt
J 1 12000
J 3 50000
B 1 3 600
```

To copy the entirety of handle 1 to the end of handle 2 (appended):

```
O 1 R /sourcefile.txt
O 2 RW /destfile.txt
J 2 E
B 1 2
```

or (note that the destination file is opened for append)

```
O 1 R /sourcefile.txt
O 2 A /destfile.txt
B 1 2
```

Close

Description

Closes an open file handle. If no file handle is given, all open file handles are closed.

Format

`C [`*`fh`*`]`

Parameters

- *`fh`* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.

Response Format

`NULL` | Enn

Example

Close file handle 1:

```
C 1
```

Close all files:

```
C
```

Change Timestamp

Description

Changes the “modified” time of the given file/directory. All parameters are required.

Format

`D` *`year month day hour min sec path`*

Parameters

- *`year`* is full 4 digit year.
- *`month`* is 1 → 12.
- *`day`* is 1 → 31 (depending on month).
- *`hour`* is in 24 hour format (0 → 23).
- *`min`* is 0 → 59.
- *`sec`* is 0 → 59.

- *`path`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
    - e.g. `/logs/january/jan3.log`

Response Format

`NULL` | Enn

Example

```
D 2009 8 11 17 22 00 /filename.txt
```

Erase File

Description

Erases/deletes the given file/directory. If the path given is a directory, it must be empty before it can be deleted.

Format

`E` *`path`*

Parameters

- *`path`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
    - e.g. `/logs/january/jan3.log`

Response Format

`NULL` | Enn

Example

To delete a directory:

```
E /emptydir
```

To delete a file:

```
E /filename.txt
```

Free Handle

Description

Free Handle returns the next available file handle.

Format

```
F
```

Parameters

None

Response Format

n | Enn

- *n* is the free handle number (1 - 4).

Example

When no files are open:

F
1

When all files are open:

F
E03

Info

Description

Gives the file position and the file size for the given file handle.

Format

`I fh`

Parameters

- *fh* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.

Response Format

response | Enn

response is in the following format:

`pp..ppp/ss..sss`

where:

- `pp..ppp` is the current byte position in the file
- `ss..sss` is the file size.

`pp..ppp` and `ss..sss` are separated by a forward slash '/'.

Example

For a file handle whose byte position is 3250 for a file which is a total of 560700 bytes:

I 1
3250/560700

Jump

Description

Jumps to any location in a file. If you use "E" as the second parameter, **Jump** will seek to the end of the file.

Note

If the file is opened for writing, the **Jump** command will automatically extend the file if `addr` specified is larger than the file size. This is useful for ***pre-allocating*** a file to reduce delays during writing.

Important

If the file is extended, the data beyond the end of the file is ***undefined***, so care must be taken to ensure your data is terminated properly.

You can use this command in junction with the Truncate command to pre-allocate then truncate the file.

Format

`J` *`fh addr`*`|E`

Parameters

- *`fh`* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.
- *`addr`* is the position to which you want to jump/seek.
- `E` can be used to jump to the end of the file.

Response Format

`NULL` | Enn

Example

To jump to byte position 2000 in file handle 1:

J 1 2000

To jump to the end of file handle 2:

J E 2

Card Info

Description

Gets card specific information for the inserted card. If no parameters are given, then the raw byte data for the CSD (16 bytes) and CID (16 bytes) are returned (32 raw bytes total).

If the parameter is "`B`", then the CSD and CID are ASCII encoded - i.e. Two ASCII characters for each raw byte. e.g. 0x3E is sent as `3E` - two characters.

If the parameter is "`I`", then more data is returned (separated by «CR»).

1. Card type
2. CSD (16 bytes)
3. CID (16 bytes)
4. OCR (4 bytes)

Card type is one of:

Card type	Description
1	MMC (MultiMedia Card)
2	SD V1 (Secure Digital Card)
4	SD V2 (Secure Digital Card)
12	SDHC (Secure Digital - High Capacity Card)

CSD, CID, and OCR are all sent as ASCII encoded (i.e. Two ASCII characters for each raw byte).

Format

`K [B | I]`

Parameters

- `B` - optional parameter to return ASCII encoded CSD and CID.
- `I` - optional parameter to return more data in ASCII encoded form.

Response Format

«SP»*response* | Enn

See examples for format of response.

Example

K
«SP»***16RAWBYTES***
K B
«SP»002600321F5983C4FEFACFFF924040C1035344534432353655401 16A94003C29
K I
«SP»Card type: 2 CSD:002600321F5983C4FEFACFFF924040C1 CID:035344534432353655401 16A94003C29 OCR:80FF8000

List Directory

Description

The **List Directory** command will list all the files in a given path. If the path is a file, then only the details for that file are given. If the path contains wildcards, then the files matching the pattern will be returned.

List Directory (`L` *`path`*) lists all files that match *`path`* without interruption. If a directory is large, this can be difficult to manage. In that case, use `LS` *`path`* to begin a directory listing iteration process, then use `LI` *`pattern`* to iterate through the listings.

Format

`L` *`path`*

`LC` *`path`*

`LS` *`path`*

`LI` *`pattern`*

Parameters

- *`path`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward

slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
    - e.g. `/logs/january/jan3.log`

- *`pattern`* - a filename pattern which can contain wildcards ("`?`" and "`*`").

— —

`LC` *`path`* returns the count of files that match the path.

`LS` *`path`* starts a List Directory iteration process.

`LI` *`pattern`* iterates through a directory listing, returning the next file that matches *`pattern`*. *`pattern`* is required (just use "`*`" to match everything).

For `L` *`path`* and `LC` *`path`*, *`path`* can also contain wildcards ("`?`" and "`*`").

In `LS` *`path`*, *`path`* can not contain wildcards, and must point to a directory.

Response Format

«sp»*`response`* | Enn

`response` has one of two formats based on the "`L`" setting.

L = 0:

```
<<sp>>D | ss..sss filename1<<cr>>
D | ss..sss filename2<<cr>>
...
D | ss..sss filenameN<<cr>>
```

where:

- `D` indicates a directory
- `ss..sss` is the size of the file
- `filenameN` is the filename or directory name

L = 1:

```
<<sp>>DRHSA yyyy/mm/dd hh:mm:ss ss..sss filename1<<cr>>
DRHSA yyyy/mm/dd hh:mm:ss ss..sss filename2<<cr>>
...
DRHSA yyyy/mm/dd hh:mm:ss ss..sss filenameN<<cr>>
```

where:

- `DRHSA` are the attributes for the file. If the attribute is not set, the value is "`-`". `D` indicates a directory.
- `yyyy/mm/dd hh:mm:ss` is the modification date of the file/directory.
- `filenameN` is the filename or directory name

Example

"`L`" setting = 0:

L /
«sp»D DCIM«cr» 721886 B0000.mp3«cr» 40192 B0001.mp3«cr» 23318 B0002.mp3«cr» 46519 hidden.txt«cr»

"L" setting = 1:

L /
«sp»D---- 2009/05/10 11:03:54 DCIM«cr» ----A 721886 2009/05/13 10:12:16 B0000.mp3«cr» ----A 40192 2009/05/13 10:12:16 B0001.mp3«cr» ----A 23318 2009/05/13 10:12:16 B0002.mp3«cr» --H-A 46519 2009/05/13 10:22:38 hidden.txt«cr»

Using wildcards:

L /PICTURES/*.JPG
«sp»----A 2008/09/23 09:18:32 2021392 IMG_2538.JPG«cr» ----A 2008/09/23 09:31:26 1662290 IMG_2542.JPG«cr» ----A 2008/09/23 09:32:02 1893947 IMG_2543.JPG«cr» ----A 2008/10/30 12:34:50 1117269 IMG_2551.JPG«cr»

File count (with wildcard):

LC /PICTURES/*.JPG
«sp»4

Iteration example:

LS /PICTURES
«sp»
LI *.JPG
«sp»----A 2008/09/23 09:18:32 2021392 IMG_2538.JPG«cr»
LI *.JPG
«sp»----A 2008/09/23 09:31:26 1662290 IMG_2542.JPG«cr»
LI *.JPG
«sp»----A 2008/09/23 09:32:02 1893947 IMG_2543.JPG«cr»
LI *.JPG
«sp»----A 2008/10/30 12:34:50 1117269 IMG_2551.JPG«cr»
LI *.JPG
E07

Make Directory

Description

The Make Directory command will create a directory at the path specified.

Format

`M` *`path`*

Parameters

- *`path`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
    - e.g. `/logs/january/jan3.log`

Response Format

NULL | Enn

Example

M /LOGS/JANUARY

Rename

Description

Renames/moves a file from one path to another.

Format

`N` *`path`*`|`*`newpath`*

`path` and *`newpath`* are separated by a vertical bar/pipe/vertical slash '|'.

`newpath` must not already exist.

Parameters

- *`path/newpath`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
    - e.g. `/logs/january/jan3.log`

Response Format

NULL | Enn

Example

Rename a file:

N /www/index.html|/www/index.htm

Move a directory:

N /www/images|/images

Open

Description

Opens a file handle in one of 4 different modes described above.

Note

If a file is created, the file modification date is set to the current time from the built-in RTC (Real Time Clock). You can change the time by using the Time command. You can modify the file modification date using the Change Timestamp command.

Format

`O` *`fh mode path`*

Parameters

- *`fh`* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.
- *`mode`* is one of:
  - "`R`" – Open in read-only mode. No data can be written to the file.
    The filename in the path ***must*** exist.
  - "`W`" – Open in write mode. This opens a ***new*** file for writing. The file must not already exist.
    The filename in the path must ***NOT*** already exist.
  - "`A`" – Open in append mode. This opens a new or existing file for writing. Once opened, the file handle is positioned at the end of the file.
    If the filename in the path does not exist, it will be created.
  - "`RW`" – Open in read/write mode. This opens a new or existing file for reading and/or writing. Once opened, the file handle is positioned at the ***beginning*** of the file.
    If the filename in the path does not exist, it will be created.
- *`path`* is the absolute path to a file/directory. A properly formatted path must begin with a "`/`" (forward slash) and begins at the root directory. Subdirectories are separated with "`/`" (forward slash).
  - e.g. `/logs/january/jan3.log`

Response Format

`NULL` | Enn

Example

Open a file for reading:

O 1 R /LOGS/JANUARY/JAN03.LOG

Open a file for reading and writing:

O 1 RW /www/httpdocs/chatlog/chatlog002.log

Query Volume

Description

Returns the free space and the total size of the inserted card. The two values given are in decimal format and in kibibytes (i.e. 1024 bytes per kibibyte).

Format

```
Q [A]
```

Parameters

- `A` displays the file system type as well as the free/total information.

Response Format

`response` | Enn

If there are no parameters, *`response`* is of the form:

uu..uuu/tt.ttt

where:

- `uu..uuu` is the free space on the card.
- `tt..ttt` is the total space on the card.

If "`A`" parameter is given, *`response`* is of the form:

FATff«cr» uu..uuu/tt.ttt

where:

- FATff is the file system type (one of FAT12, FAT16 or FAT32).
- `uu..uuu` is the free space on the card.
- `tt..ttt` is the total space on the card.

Example

Q
51245/61525
Q A
FAT12«cr» 51245/61525

Read

Description

You can read up to 512 bytes at a time using the **Read** command. If the *`num`* parameter is larger than the number of bytes remaining to be read from the file, then only the remaining bytes are returned. Use the Info command to find the current position. If the **Read** command is successful, a single `«sp»` character is sent, followed by the data. If an error occurs, the first character returned is "`E`", followed by an error code. Data is sent verbatim (i.e. raw data) from the file.

Format

R *fh* [*num* [*addr*]]

Parameters

- *fh* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.
- *num* is the number of bytes to read. Optional. If not specified, up to 512 bytes will be returned.
- *addr* is the address at which to start reading. Optional. *num* ***must*** be given for this parameter to be used.

Response Format

«sp»*response* | Enn

response is preceded by a «sp», indicating a good read. The length of response is variable, and depends on the *num* parameter, the position of the file handle, and the size of the file.

Example

File handle position = 0, file size = 38 bytes:

R 1
«sp»13:22:02 ADC1=4.9V«cr» 13:22:32 ADC1=4.9V«cr»

A subsequent read:

R 1
E07

Same file, read only 18 bytes (starting at address 0):

R 1 18 0
«sp»13:22:02 ADC1=4.9V

Read Line

Description

The **Read Line** command is very similar to the **Read** command, except that data is returned up to the next EOL terminator. The "E" setting determines the type of EOL terminator that is checked. The EOL terminator is ***not*** returned, only the data up to the EOL.

Format

RL *fh* [*num* [*addr*]]

Parameters

- *fh* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.

- *num* is the number of bytes to read. Optional. If not specified, up to 512 bytes will be returned.
- *addr* is the address at which to start reading. Optional. *num* ***must*** be given for this parameter to be used.

Response Format

«sp»*response* | Enn

response is preceded by a «sp», indicating a good read. The length of response is variable, and depends on the *num* parameter, the position of the file handle, the size of the file, and the location of the next EOL. Refer to the "E" setting.

Example

File handle position = 0, file size = 38 bytes. This response differs from what is returned by the **Read** command:

RL 1
«sp»13:22:02 ADC1=4.9V
RL 1
«sp»13:22:32 ADC1=4.9V
RL 1
E07

Same file, read only 18 bytes (starting at address 0):

RL 1 18 0
«sp»13:22:02 ADC1=4.9V

Settings

Description

Settings are non-volatile, and are loaded on power up.

When the unit is put into Update Mode, the default setting values (shown in the settings table) are restored.

Settings can also be set using the Boot Config File. The settings are read from the file on power-up and replace the current settings.

A description of all of the settings can be found in the Settings section.

Format

S *setting* [*value*]

Parameters

- *setting* is the setting to be set/returned. See the Settings Table.
- *value* is the value to which *setting* should be set. Optional.

Response Format

NULL | *response* | Enn

If no *value* is given, then *response* is the current value of *setting*.

Example

To set the bit rate to 2400 bps:

S D 5

To get the current bit rate:

S D
5

Time

Description

Gets/sets the internal RTC (Real Time Clock).

Format

T [*year* [*month* [*day* [*hour* [*min* [*sec*]]]]]]

Parameters

- *year* is full 4 digit year.
- *month* is 1 → 12.
- *day* is 1 → 31 (depending on month).
- *hour* is in 24 hour format (0 → 23).
- *min* is 0 → 59.
- *sec* is 0 → 59.

Providing no parameters returns the current time.

Response Format

NULL | *response*

If at least one parameter is given, no response is sent.

response is of the format: YYYY/MM/DD«sp»HH/mm/SS

Example

Get the current RTC time:

T
2009/05/22 13:42:02

To set the date and time to 2009/05/22 13:00:00:

T 2009 5 22 13 00 00
T
2009/05/22 13:00:00

To change just the date to 2009/05/23:

T 2009 5 23
T
2009/05/23 13:00:15

Truncate

Description

Truncates the file at the current position.

WARNING This will effectively delete all data after the current position in the file. Use with care.

Format

`U` *`fh`*

Parameters

- *`fh`* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.

Response Format

`NULL` | Enn

Example

I 1
1200/5000
U 1
I 1
1200/1200

Version

Description

Returns the current firmware version and serial number.

Format

V

Parameters

No parameters.

Response Format

response

response is of the format: *mmm*.*nn*[-b*xxx*]«sp»SN:*sss…sss*

where:

- *mmm* is the major version code.
- *nn* is the minor version code.
- *xxx* is the beta version code. This is only returned in the beta versions.
- *sss…sss* is the serial number/code. Programmed only on request. Defaults to UMM1-OEM.

Example

V
102.08-b003 SN:UMM1-OEM

Write

Description

You can write up to 512 bytes at a time with the **Write** command. If *num* is omitted, then 512 bytes will be expected.

After the command is received, *num* (or 512) bytes are expected to be received. Data is received raw (i.e. no escape sequences are required).

By default, there is no time-out for how long it takes to send the data. This means that the uMMC will wait ***indefinitely*** for all the data to be sent.

If the value of the **Write Time-out** setting is greater than 0 (zero), then if the time taken between sending bytes exceeds that value (in tens of milliseconds), the **Write** command will terminate, write the accepted bytes to the file, and return to the command prompt. No error will be returned.

Format

W *fh* [*num*]

Parameters

- *fh* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.
- *num* is the number of bytes to write to the file (1 → 512). Optional (if not given, 512 is assumed).

Response Format

NULL | Enn

Example

I 1
0/0
W 1 18
13:22:02 ADC1=4.9V
I 1
18/18

Write Line

Description

The **Write Line** command is very similar to the **Write** command. The difference is that the command is terminated when a «cr» is received (or 512 bytes, whichever comes first).

You can write up to 512 bytes at a time with the **Write Line** command. If *num* is omitted, then 512 bytes will be expected.

After the command is received, *num* (or 512) bytes are expected to be received. Data is received raw (i.e. no escape sequences are required).

The **Write Line** command will terminate if a «cr» is received, append the appropriate EOL (End Of Line) terminator (depending on the **Read/Write Line Terminator** setting), and write the data to the file.

By default, there is no time-out for how long it takes to send the data. This means that the uMMC will wait ***indefinitely*** for all the data to be sent.

If the value of the **Write Time-out** setting is greater than 0 (zero), then if the time taken between sending bytes exceeds that value (in tens of milliseconds), the **Write** command will terminate, write the accepted bytes to the file, and return to the command prompt. No EOL terminator will be written. No error will be returned.

Format

WL *fh* [*num*]

Parameters

- *fh* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.
- *num* is the number of bytes to write to the file (1 → 512). Optional (if not given, 512 is assumed).

Response Format

NULL | Enn

Example

Write a line of text to a file (Setting “E” = 0 → «cr» as EOL):

```
E /LOG.TXT
O 1 RW /LOG.TXT
S E
0
I 1
0/0
WL 1
13:22:02 ADC1=4.9V«cr»
I 1
19/19
```

Write a line of text to a file (Setting “E” = 2 → «cr»«lf» as EOL):

```
E /LOG.TXT
O 1 RW /LOG.TXT
S E 2
S E
2
I 1
0/0
WL 1
13:22:02 ADC1=4.9V«cr»
I 1
20/20
```

File Status

Description

Returns the status of the system, or the status of a file handle.

If no parameter is given, the card status is returned. e.g. If a card is not inserted, E08 is returned. If no error, a single «sp» is returned.

If a file handle is given, the status of the file handle is returned. e.g. If the file handle is pointing to the end of the file, E07 is returned.

Format

Z [*fh*]

Parameters

- *fh* is a file handle (1 - 4). Use the Free Handle command to get a free file handle.

Response Format

«sp» | Enn

Example

Z
«sp»
Z 2
E07

Appendix

Table of Settings

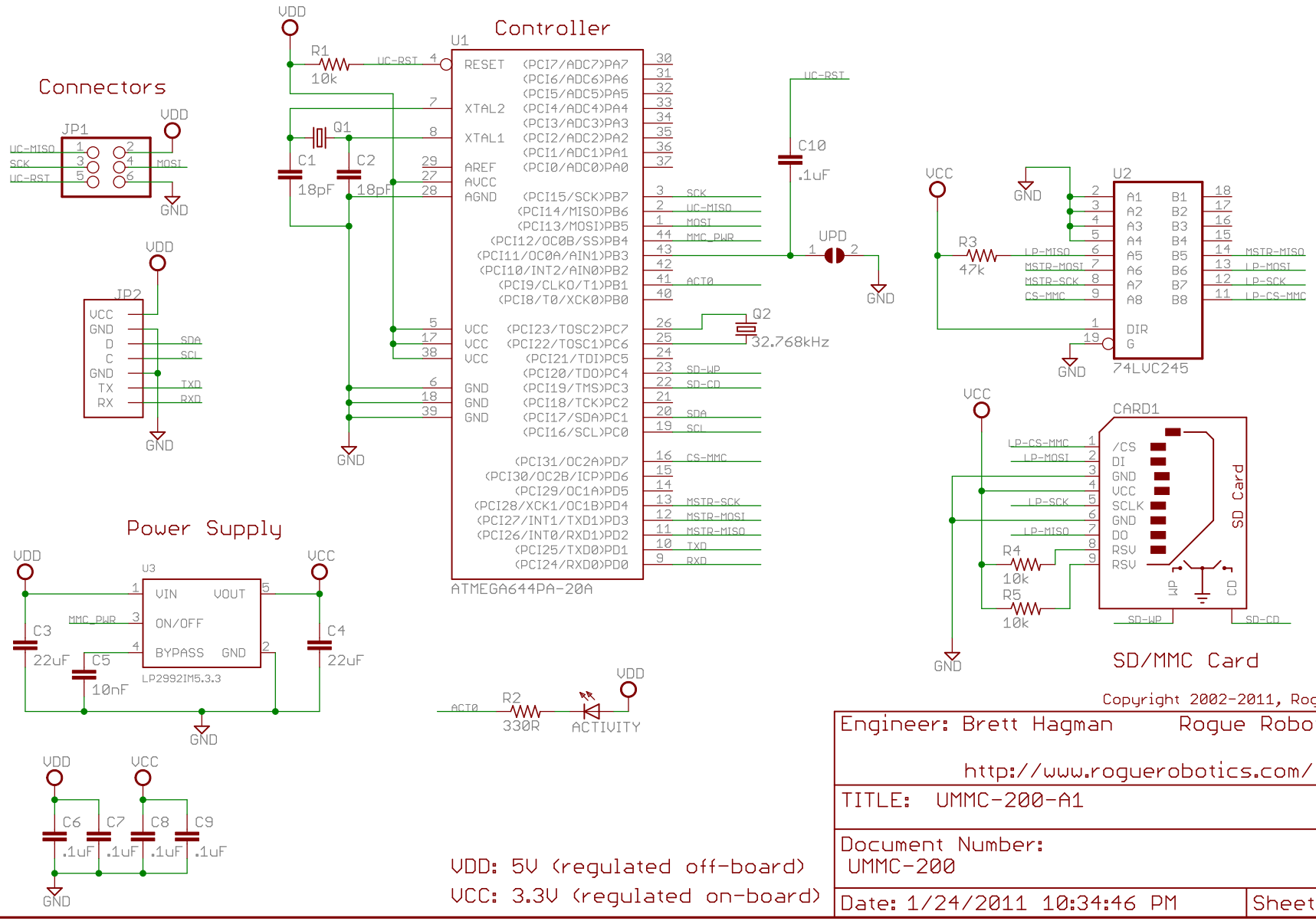
Setting	Name	Value	Description (default)
D	Baud/Bit Rate	**0**	**9600 bps**
		1	19200 bps
		2	38400 bps
		3	57600 bps
		4	115200 bps
		5	2400 bps
		6	4800 bps
		7	230400 bps
		8	460800 bps
T	Write Time-out	**0** to 254	Time in 10 ms increments (e.g. 20 = 200 ms) **0 = No time-out (waits indefinitely)**
P	Prompt Character	1 to 254	**62 ('>')**
L	Directory Listing Style	**0**	**old style**
		1	new style
R	Response Delay	**0** to 254	Time in 10 ms increments (e.g. 5 = 50 ms) **0 = No response delay (immediate response)**
C	Copy Progress Style	**0**	**none**
		1	progress hash ”#” every 2048 bytes
		2	total bytes copied & copy rate
		3	progress hash, bytes copied & copy rate
E	Read Line/Write Line Terminator	**0**	**CR**
		1	LF
		2	CRLF

Table of Error Codes

Error Code	Description

02	Command buffer overrun (i.e. command too long)
03	No free files
04	Unknown command
05	Card initialization error
06	Command formatting error
07	End of file (EOF)
08	Card not inserted
09	Card reset failure
0A	Card physically write protected (check write protect switch on side of card)
E5	Not a directory
E6	Read only file - Can not perform command on this file
E7	Not a file - command expected a directory
E8	Write failure
E9	Improper mode for writing (check that the file is open for writing)
EA	No free space (card is full)
EB	Given file handle is not open
EC	Improper mode for reading (check that the file is open for reading)
ED	Unrecognized mode specified in Open command
EF	General FAT failure - File system is corrupted (test it on a PC)
F1	File handle provided is already open
F2	File in path specified does not exist
F3	Error while creating directory entry
F4	File already exists
F5	File in path specified is not valid (check spelling, and no strange characters in path)
F6	Invalid handle specified

uMMC Data Module



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