Flashlite 186

User's Manual

Unless otherwise noted, this document and the information herein disclosed are proprietary to JK microsystems, Inc. Any person or entity to whom this document is furnished or having possession thereof, by acceptance, assumes custody thereof and agrees that the document is given in confidence and will not be copied or reproduced in whole or in part to meet the purposes for which it was delivered.

The information in this document is subject to change without notice, and should not be construed as a commitment by JK microsystems, Inc. JK microsystems, Inc. will make every effort to inform users of substantive errors.

JK microsystems, Inc. disclaims all liability for any loss or damage resulting from the use of this manual or any software described herein, including without limitation contingent, special, or incidental liability.

JK microsystems, Inc. recognizes our customer's need for a consistent product and will make every effort to provide one. In order to provide the best possible product for all of our customers, we reserve the right to make incremental improvements in our product designs.

Flashlite is a trademark of JK microsystems, Inc. MS-DOS is a registered trademark of Microsoft Corporation. XDOS is a copyright of HBS Corporation. All other brand and product names are trademarks or registered trademarks of their respective companies.

Flashlite 186 User's Manual Version 1.4
Copyright © JK microsystems, Inc.
All rights reserved
Printed in U.S.A.
Document Part No. 94-0025
Published November 2003

Limited Warranty

JK microsystems, Inc. warrants each Flashlite 186 to be free from defects in material and workmanship for a period of 90 days from the date of purchase. This warranty shall not apply to any unit which has been subject to misuse, neglect, accident, or abnormal conditions of operation.

JK microsystems' obligation under this warranty is limited to repairing or replacing, at JK microsystems' option, any unit returned to the factory within 90 days of the date of purchase, provided that JK microsystems determines that the unit is defective and has been used in compliance with the terms of this warranty. If the failure has been caused by misuse, neglect, accident, or abnormal conditions of operation, repairs will be billed at a nominal cost.

The foregoing warranty is exclusive and in lieu of all other warranties, expressed or implied, including, but not limited to, any warranty of merchantability or fitness for any particular purpose. JK microsystems shall not be liable for any special, incidental or consequential damages, whether in contract, tort, or otherwise.

Important Notice

Life Support / Mission Critical Applications

This product is not fault-tolerant and is not designed, manufactured or intended for use or resale as on-line control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of our hardware or software could lead directly to death, personal injury, or severe physical or environmental damage.

Table of Contents

Overview

The Flashlite 186 single board computer is based on the RDC R8822 microcomputer. The R8822 is a high performance, 16-bit, single-chip microcomputer that is software compatible with the 80C186 family of microprocessors. DOS compatibility allows development in a familiar environment with a wide range of tools. High endurance flash memory eliminates EPROM programming without worry of damaging the onboard non-volatile memory with repeated program cycles. Applications are uploaded directly into the flash disk. Expansion options provide high capacity flash storage eliminating the size and reliability problems associated with electro-mechanical storage devices.

Software development for the Flashlite 186 is remarkably simple and quick. Programs are written on a PC compatible computer in the language of your choice. After your application has been compiled or assembled and linked into .EXE or .COM form, it is uploaded to the Flashlite's flash disk with your favorite telecommunications program using the X-Modem protocol. The application can then be tested and debugged through the serial console. When the application is running to your satisfaction, the startup batch file can be modified so that the application will load and execute upon reset or powerup.

Features

33MHz RDC 8822 Processor (x186 Compatible)
7-34 Volt (unregulated) DC or 5V (regulated) DC power
512k Bytes DRAM Memory (16 bit data path)
512k Bytes Flash Memory
High Speed Serial Ports:
    1 RS-232 Port with Handshake (TxD, RxD, DCD, RTS, CTS, GND)
    1 Jumper Configurable as RS-232, TTL RS-232 or RS-485
Console/Debug Serial Port (3 wire RS-232, software UART)
44 Digital I/O Lines (2 reserved for console/debug serial port)
3 - 16 bit timer channels
Watchdog timer (generates internal processor reset)
32Pin Dip Socket to accept M-Systems DiskOnChip
Compact Size, 4.20" x 3.60" (106.7mm x 91.4mm), 2.1oz (59gm)
Driver Library (C and Basic) - Serial ports, PIO, alphanumeric LCD, and keypad

Operation

The Flashlite is configured with two 'disk drives' A: and B:. Drive A: contains DOS, the BIOS, and utility programs essential to the operation of the Flashlite. Drive A: is read-only. Drive B: is read/write and contains optional utility programs and is available for user files and applications.

The serial console port for the Flashlite has been implemented using bit I/O to keep the processor serial ports free for user applications. The port is configured for 9600 baud, 8 data bits, 1 stop bit and no parity. This is the primary mode of communicating with the Flashlite. DOS and the BIOS treat this port as the logical devices STDIN and STDOUT, in place of a keyboard and monitor.

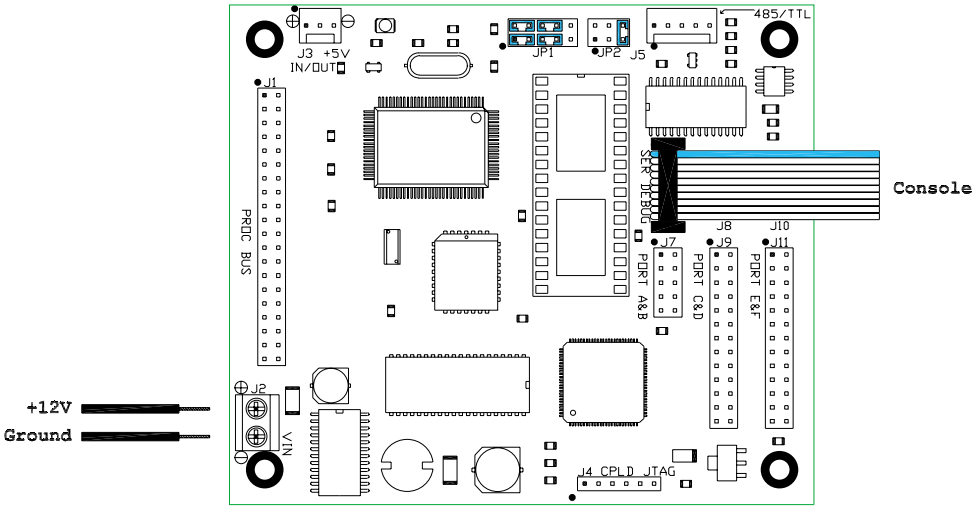
! The console serial port is intended only for use as a development tool. While it is in use, it disables interrupts for a significant period of time. This may cause disruptions with the supplied serial port drivers and other devices and functions requiring interrupt support.

When power is applied to the Flashlite or when it is reset, the board goes through its initialization procedure and then starts DOS. A simple (read-only) `AUTOEXEC.BAT` file is executed and then the board is ready to use. The batch file performs several functions before the user is given control. The DOS search path is set, the DOS prompt is set, the CTRL-C flag (discussed later in this manual) is checked and finally, an attempt is made to execute a file named STARTUP on the B: drive. This provides a convenient way for custom applications to execute immediately after initialization of the Flashlite. If you wish to have your application start automatically, create a batch file named `STARTUP.BAT` that invokes the program. Renaming your application `STARTUP.EXE` or `STARTUP.COM` is *not* recommended. If this is done and the program locks up, typing CNTL-C at bootup may not break the program and exit to the DOS prompt.

! Although the flash memory devices used have a guaranteed lifetime of over 10,000 write cycles, it is possible for an application to quickly wear them out. The flash memory is intended to store programs, and setup data which is normally not changed. Avoid storing data or frequently changed information on the flash disk.

Getting Started

To begin development with the Flashlite, you will need a PC compatible computer with a telecommunications program and a free serial port. Connect the Flashlite's Debug/Console Port to the PC's serial port with a 9-pin serial cable (straight through wiring). Run the telecommunications program and configure the serial port for 9600 baud, 8 data bits, 1 stop bit and no parity. Apply power to the Flashlite, using our A/C adapter PN 88-0006 or a source of unregulated DC between 7 and 34 Volts, capable of supplying 2 Watts. Observe the polarity indicated on the board silkscreen.



The Flashlite should respond with a welcome message and a B: prompt. Enter `DIR` to look at the directory of drive B:. If you do not get a welcome message or echo of the characters that you type, you need to check your serial port setup. To test everything but the Flashlite, remove the serial cable from J6 and jumper pins 3 and 5. If characters typed on the keyboard are not echoed on the screen, the problem is with your setup. You must resolve the problem before you can continue.

If you were able to do a `DIR`, take a few minutes to explore the contents of the Flashlite's file system. You will find all of the essential utilities on drive A: and some optional programs on drive B:. Drive A: is write-protected and cannot be altered. Drive B: is read/write and can be changed or reformatted.

After you have looked at the programs on the Flashlite, the next step is to try to upload a file. This is the procedure for getting a file from your PC to the Flashlite. On the Flashlite, type the command `UP` followed by the name of the file you wish to upload. The Flashlite will begin sending characters to your PC polling it for the file.

On your PC, start the transfer, usually by pressing the PgUp key. The telecomm program should respond by requesting the file name and protocol. Enter the file name and select X-Modem for the protocol. The transfer should start and when it is complete, you should get a new B: prompt on the screen. If the transfer does not work, the problem is most likely the Carrier Detect signal (pin 1 on the DB-9 connector) into the PC being sensed as low or false. Make sure that the signal is at least +3 volts into your PC if you are not able to transfer files.

If the transfer terminated without problems, you have a working development environment for the Flashlite controller. To transfer files from the Flashlite to the development PC, use the DOWN command described in the Utilities section of this manual.

The Flashlite does not have a hardware clock calendar. The time and date will be maintained by DOS until the power is cycled. If the correct time and date are required after a power cycle, they must be set either from the command prompt or via user software. The time and date can be set with the following commands:

```
B:\>TIME 13:30:00        Sets the time to 1:30 pm
B:\>DATE 10-29-2002      Sets the date to October 29, 2002
```

When power is applied to the Flashlite, one of the first things the BIOS initialization code does is check for a CNTL-C character typed at the console. If this character is typed as soon as the board is powered up or reset, a flag is set which overrides some of the initialization process. When DOS runs its AUTOEXEC.BAT file on drive A:, the state of the CNTL-C flag is also checked and any user application set to run on drive B: is not loaded. This insures that a hung application or quiet console can always be interrupted.

If the CNTL-C flag is not set, the AUTOEXEC file will attempt to transfer control to a file named STARTUP on drive B:. DOS also looks for and, if present, loads CONFIG.SYS from drive B:.

Hardware

Memory Configuration

The R8822 processor is configured in real mode with a physical address space of 1 megabyte. The DRAM is located between 00000h and 7FFFFh, the flash is between 80000h and FFFFFh. A 32-pin DIP socket is provided for additional flash, RAM, or EPROM. This memory can be accessed by reprogramming the chip select unit.

During the boot process the BIOS is copied from flash into the top of RAM. The BIOS executes out of RAM. After the BIOS is copied, the flash is removed from the memory map with the exception of a 64k window starting at segment F000. This allows the reset procedures to work properly while maintaining user access to peripherals mapped in the higher portion of memory. When a request for data on drive A: or B: is processed, the flash is mapped in to the top 512k of memory, the drive read, then mapped out again. If present, the DiskOnChip occupies an 64k block of memory starting at segment E000 hex.

I/O Configuration

The R8822 internal peripherals (UARTs, counter/timers, and interrupt controller) are not PC compatible or located at their traditional I/O port addresses.

For addressing and programming the peripherals specific to the R8822, please refer to the RDC R8822 Microcontroller User's Manual. The manual is available in PDF format on the Development Kit CD or from our web site at http://www.jkmicro.com

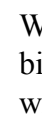
Digital I/O Ports

The Flashlite has a total of 44 bits of I/O. 40 bits are generated by a CPLD and the remainder are from the R8822 processor.

PIO0-1, 2 bits of I/O are controlled by the R8822 processor. These bits are individually configurable as inputs or outputs.

PIO10-11, 2 bits of I/O are controlled by the R8822 processor. PIO10 is used as the software serial receive line and PIO11 is used as the software serial transmit line.

The PIO bits 1 and 2 are defined as inputs upon powerup. To read their states, you must perform a 16-bit input from the R8822 PDATA0 register and look at bits 0 and 1. The base address for all R8822 internal registers is 0FFxxh, with PDATA0 at 0FF74h. To change the I/O's to outputs, you must clear the respective bit(s) in the R8822 PDIR0 register.



When changing any bit value in the R8822 PIO registers, it is essential that all of the other bit values be preserved. You must read the 16-bit register, modify the desired bit(s), and write the new value to the register.

After the bit(s) are cleared in the PDIR0 register, you can change their state by reading the PDATA0 register, modifying the bit(s), and writhing out the new value to PDATA0. See the section "Programming the Ports" for more information.

LED, the LED at location DS1 is controlled by bit 10 of the PDATA1 register at 0FF7Ah. Set the bit (1) to turn the LED off, clear the bit (0) to turn the LED on.

Ports A - F, 40 bits of I/O, are controlled by a CPLD. The I/O from the CPLD is grouped into two 4-bit ports (A & B) and four 8-bit ports (C thru F). Each of the six ports may be configured as either inputs or outputs. The following tables show the port registers, addresses, and configuration bits.

Register	Address
Port A	0x600
Port B	0x601
Port C	0x602
Port D	0x603
Port E	0x604
Port F	0x605
IOConf	0x606

Ports A through F have a single data register that is read/write. Data read from the port represents the current state of the port, data written to the port will be present on the port pins, if the port is configured as an output. Each port may be configured as either an input or an output. Write a 0 to the appropriate bit in the direction register to configure the port as an input, write a 1 to configure it as an output. All ports default to inputs.

! The CPLD is a low power device that operates from 3.3 Volts. Although the inputs are 5V tollerant, care must be taken to avoid exceeding the current specifications for the device. Shorting an input to 5V will damage the CPLD.

IO Configuration Register (I/O Port 606 hex)

Bit	7	6	5	4	3	2	1	0
Function	Not Used	Not Used	Port F DIR	Port E DIR	Port D DIR	Port C DIR	Port B DIR	Port A DIR
Default	1	1	0	0	0	0	0	0

Driving Loads with the Ports

The ports on the Flashlite 186 are capable of driving small loads or interfacing to TTL logic devices. These ports can only source/sink a few milliamps. In order to interface with many loads, additional circuitry, such as a transistor or relay, will be required. Designing the interface between an output pin and a higher current load can present a challenge, especially if high speed is required or the load is inductive in nature.

Switching inductive loads such as relays, solenoids and motors can generate transient voltages many times larger than the steady-state operating voltage of the load. For example, turning off a 12 volt solenoid can easily create a negative spike of 200 volts. Worst case, these transients can destroy your controller. In milder cases, they can cause program failures and flash memory corruption. In the case of high current, high inductance devices, the spike need not even be directly connected to the controller to cause damage or program failure.

Controllers damaged by inductive spikes are considered to be abused and are not eligible for warranty repair.

A detailed study of dealing with inductive spikes is beyond the scope of this manual. For more information, a good starting point is The Art Of Electronics, 2nd Ed. (Horwitz and Hill, 1989) pages 52-53.

The following items should be considered when driving inductive loads:

A) When driving a DC inductive load, place a diode in parallel with the load. In most cases, the diode can be a general purpose power diode such as a 1N4002. The cathode (banded end) of the diode should connect to the positive side of the load. Locate the diode as physically close to the load as possible. This applies to a small relay driven by a port pin, as well as a larger inductive load connected to the contacts of a relay.

B) If you are using a relay to switch an AC-powered inductive load, put a varistor in parallel with the load. The varistor voltage rating should be about 1.5 times the peak-to-peak steady-state voltage of the load.

C) Relays switching an inductive load may require a capacitor placed across their contacts. 0.1µF to 1.0µF is a good starting point. If the relays are switching an AC load, place a 100 ohm resistor in series with the capacitor.

D) Do not use the controller's ground or power conductors to carry current from switched inductive loads. Isolate these signals and route then directly to and from the power supply and as far away from the controller as possible. A separate power source for large inductive loads is strongly recommended. In the case of very large inductive loads, a separate enclosure for the controller may be required.

Programming the Ports

The I/O ports are located in the processor I/O space. Using the ports requires the use of functions unique to the x86 family of processors. Creating a pointer to the location may seem logical, but that reference would be in memory space, not I/O space. The Borland C functions `inport(`*`port`*`)` and `outport(`*`port,value`*`)` are 16 bit (word) instructions, `inportb(`*`port`*`)` and `outportb(`*`port,value`*`)` are 8 bit (byte) instructions. These functions are part of the `dos.h` header file. Similar functions (and header files) are available for other C compilers and languages.

The following code illustrates the use of `inportb()` and `outportb()`.

```
unsigned char port;
port = inportb(PORT_DIR);                       /* get value of dir. reg */
port |= PORT_DIR_MASK;                          /* set dir. bit for input */
outportb(PORT_DIR, port);                       /* write value to dir. reg */
printf("PORT: 0x%X\n", (int)inportb(PORT));   /* read & print port value */
```

Asynchronous Serial Ports

The Flashlite has 2 serial ports, Serial 0 and Serial 1. Both ports are internal to the R8822. These UARTs are *not* compatible with the 16450 UARTs on a PC. The maximum data rate is 115k Baud at RS-232 levels.

Serial 0 is wired as Data Terminal Equipment (DTE) for connection to a peripheral such as a modem. This port is jumper configurable to be either RS-232, TTL level RS-232 (2 wire) or half-duplex RS-485. When configured to use RS-232 levels, this is port implements the handshaking RTS, CTS, and DCD control lines.

Serial 1 is wired as Data Communications Equipment (DCE) for direct connection to a computer or terminal. This port is configured as a 3 wire RS-232 port implementing RxD and TxD.

The Serial Debug/Console port does not make use of a hardware UART. It is intended for console and debugging purposes only and should not be used in a design requiring high data throughput. Its design generates an interrupt for each bit of serial data, and puts a large load on the processor when data is being received.

Driver functions for Serial 0 and Serial 1 are available in the `CSPD.COM` TSR and related `.LIB` and `.H` files located in the `Flashlite186/drivers` subdirectory on the utilities CD.

Please refer to the RDC R8822 User's Manual for specific information on the serial ports and their configuration.

RS-485 Configuration

The Serial 0 port of the Flashlite can be configured and used for RS-485 communications. To configure Serial 0 as RS-485, move the jumper on JP2 to the 1-2 location. RS-485 signals are present on pins 1 and 2 of J5. The RTS line on Serial 0 is used to control the RS-485 transmitter.

Library functions are available for use with RS-485 in the supplied driver.

The RS-485 driver is internally looped back. Characters transmitted will appear in the UART receiver. This condition is inherit with the RS-485 implementation and may present user applications implications.

Watchdog Timer

The R8822 is equipped with a watchdog timer. The watchdog is configurable to generate either a NMI or a processor reset. When enabled, software must keep the watchdog timer from timing out indicating proper operation. If the watchdog timer expires, the configured action will be taken. The watchdog signal is not available external to the R8822, so a full board reset is not possible.

DiskOnChip

M-Systems' DiskOnChip is a high performance single-chip Flash Disk. The DiskOnChip has become the standard Flash Disk module for Embedded Single Board Computers. The DiskOnChip is a Flash Disk in a standard 32-pin DIP package that has built-in TrueFFS (True Flash File System) technology, allowing full read/write disk emulation. TrueFFS provides hard disk compatibility at both the sector and file level.

The Flashlite currently supports the 8Meg Millennium DiskOnChip (MD2800-D08) with version 4.2 (or earlier) firmware. Other DiskOnChip capacities will function if they are loaded with the correct firmware, however M-Systems will not guarantee that the older firmware will continue to be supported on parts other than the MD2800.

Install the DiskOnChip module in the memory expansion socket U6. Note the location of pin 1. Set the Memory Type jumpers (JP1) for Flash memory. If the DiskOnChip is installed and functioning, there will be an installation message that is displayed during the boot process and a C: drive will be available to DOS.

```
Bios Version 2.0 for Flashlite 186
DOC Socket Services - Version 0.2
(C) Copyright 1992-1996, M-Systems Ltd.

TrueFFS-BIOS -- Version 3.3.9 for DiskOnChip 2000 (V4.2)
Copyright (C) M-Systems, 1992-2000

DOS Version 3.3c for JK microsystems Flashlite
(C) HBS Corp and JK microsystems 1991-1999


B:\>
```

If, after the installation of a DiskOnChip, DOS fails to return a prompt, the DiskOnChip probably has incompatible firmware and must be reformatted and it's firmware reloaded.

Remove the DiskOnChip, reboot the board, and upload the file DOC.EXE from the utilities CD. Power down the board, reinstall the DiskOnChip, and apply power while holding CNTL-C down. Find the file DOC.EXE and execute it. It will extract 3 files. Execute the batch file FMT_DOC.BAT and answer the prompts. This will format your DiskOnChip and load compatible firmware. You may delete the 3 files after the operation is complete.

If your application requires the Flashlite to boot from a DiskOnChip, please contact JK microsystems for more information and the configuration procedure.

Jumpers

JP1 - Socket Memory Type / Boot Memory Location

This jumper selects the type of memory in the expansion socket. Available choices are SRAM or Flash. Other memory types may be supported if their pinout is compatible with standard SRAM or Flash chips. Jumper pins 1-2 and 3-4 for SRAM or pins 1-3 and 2-4 for Flash. This jumper also allows the board to boot from the expansion socket. This is useful when performing field updates of the on-board Flash memory or when using an operating system other than DOS. Jumper pins 5-7 and 6-8 to boot from the on-board memory or jumper pins 7-9 and 8-10 to boot from the expansion socket.

Default position: 1-3 and 2-4, Flash memory expansion.
5-7 and 6-8, Boot from on-board flash.

JP2 -Serial Port 0 Select

This jumper selects the drivers and header that will be used for the Serial 0 signals. Serial 0 can be jumpered as half-duplex RS-485, TTL RS-232 (Rx and Tx), or RS-232 (Rx, Tx, RTS, CTS, DCD). Install the jumper at location 1-2 for RS-485 signals on J5, 3-4 for TTL RS-232 signals on J5 or 5-6 for RS-232 signals on J10.

Default position: 5-6, RS-232 Levels on J10.

NOTE: Only 1 jumper may be installed on JP2.

Cables and Connectors

The following tables show the signal name (direction) for each connector pin.

NOTE: N/C indicates no connection and PULLUP indicates a 1k ohm pullup resistor to Vcc. Outputs are driven by the board and received by a peripheral. Inputs are driven by a peripheral and received by the board.

Serial 0 is configured as a DTE port, and is generally used to communicate with a peripheral device. Serial 1 is configured as a DCE port, generally being used to connect the Flashlite to another computer. Serial Debug is configured as a DCE port, generally being used to connect the Flashlite to another computer.

Pin one has a square PCB pad and the others are round. This should be visible on the bottom of the PCB. Pin one will also be identified on the board silkscreen with a '1' and/or a dot. Dual row headers have ODD numbered pins on one side and EVEN numbered pins on the other. The dual row header numbering scheme follows the numbering for an IDC style ribbon cable. This numbering may not be identical to connectors with discrete wires. Use caution when connecting cables to the Flashlite.

J1		Processor Bus	
GND	1	2	VCC
GND	3	4	VCC
MREQ/	5	6	D7
MSTB/	7	8	D6
IOSTB/	9	10	D5
RW/	11	12	D4
INT0	13	14	D3
RESET/	15	16	D2
IORD/	17	18	D1
IOWR/	19	20	D0
A9	21	22	A19
A8	23	24	A18
A7	25	26	A17
A6	27	28	A16
A5	29	30	A15
A4	31	32	A14
A3	33	34	A13
A2	35	36	A12
A1	37	38	A11
A0	39	40	A10

Table 2a: Processor Bus

J2	Power
7-34 VDC	1
GND	2

Table 2b: Power Pinout

J3	Power
+5V	1
RESET/	2
GND	3

Table 2c: Power Pinout

J6		Serial Debug	
PULLUP	1	2	N/C
TxD (out)	3	4	PULLUP
RxD (in)	5	6	PULLUP
N/C	7	8	N/C
GND	9	10	N/C

Table 2d: Serial Debug Pinout

J8		Serial 1	
PULLUP	1	2	N/C
TxD (out)	3	4	PULLUP
RxD (in)	5	6	PULLUP
N/C	7	8	PULLUP
GND	9	10	N/C

Table 2e: Serial 1 Pinout

J10		Serial 0	
DCD (in)	1	2	DSR (in)
RxD (in)	3	4	RTS (out)
TxD (out)	5	6	CTS (in)
DTR (out)	7	8	N/C
GND	9	10	N/C

Table 2f: Serial 0 Pinout

J5	485 / TTL
RS485+	1
RS485-	2
GND	3
TTL TxD	4
TTL RxD	5

Table 2g: 485 / TTL Pinout

J7		Port A & B	
GND	1	2	Vcc
PA.3	3	4	PB.3
PA.2	5	6	PB.2
PA.1	7	8	PB.1
PA.0	9	10	PB.0

Table 2h: Port A&B Pinout

J9		Port C & D	
GND	1	2	Vcc
GND	3	4	Vcc
INT2	5	6	3.3V
CLKA	7	8	3.3V
PIO0	9	10	PIO1
PC.7	11	12	PD.7
PC.6	13	14	PD.6
PC.5	15	16	PD.5
PC.4	17	18	PD.4
PC.3	19	20	PD.3
PC.2	21	22	PD.2
PC.1	23	24	PD.1
PC.0	25	26	PD.0

Table 2i: Port C&D Pinout

J11		Port E & F	
GND	1	2	Vcc
GND	3	4	Vcc
INT3	5	6	3.3V
CLKB	7	8	3.3V
INT5	9	10	INT6
PE.7	11	12	PF.7
PE.6	13	14	PF.6
PE.5	15	16	PF.5
PE.4	17	18	PF.4
PE.3	19	20	PF.3
PE.2	21	22	PF.2
PE.1	23	24	PF.1
PE.0	25	26	PF.0

Table 2j: Port E&F Pinout

Software

Supported PC BIOS Functions

The Flashlite BIOS supports the following functions (software interrupts) common to PC compatible computers. Please refer to a DOS/PC reference for more information on DOS and BIOS software interrupts.

Int 10h, Video Driver, functions 9 and 0Eh
Int 11h, Get Equipment Configuration
Int 12h, Get Memory Size
Int 13h, Disk Driver, Functions 0-4
Int 14h, Serial Port Driver, Functions 0-3
Int 16h, Keyboard Driver, Functions 0 and 1
Int 19h, Boot System
Int 1Ch, Hook Timer Tick Interrupt

Driver Library

Drivers for the hardware serial ports, alphanumeric LCDs and matrix keypads are supplied on the utilities CD in the Drivers subdirectory.

For implementation details, see the README.TXT files and the driver source code for the respective drivers.

Utilities

The Flashlite comes preloaded with several utilities to aid system development. These utilities are located on drive A: of the Flashlite and/or the Utilities CD.

UP.COM

This utility facilitates uploading files to the Flashlite via the console port using the X-MODEM transfer protocol. The utility requires the user to supply the name of the incoming file. Unless otherwise specified, the file is placed in the active directory of the current drive. A write-protect error will occur if UP tries to write to the read-only A: drive.

```
B:\>up

Upload file with X-MODEM Protocol
Usage: up file...
Version 2.0 for JK microsystems Flashlite V25 and 386Ex

B:\>up test.exe

Ready, start X-modem upload now,
 Press CNTL-C to abort...
CCCC
B:\>
```

DOWN.COM

This utility facilitates downloading files from the Flashlite via the console port using the X-MODEM transfer protocol. The utility requires the user to supply the name of the file to transmit.

```
B:\>down

Download file with X-MODEM Protocol
Usage: down file...
Version 1.0 for JK microsystems SBC products

B:\>down test.exe

Ready, start X-modem download now,
B:\>
```

FORMAT.COM

If it becomes necessary to reformat the B: drive, FORMAT provides this function. CAUTION, all information on the drive will be lost during the formatting process.

```
B:\>format
Flashlite FLASH Drive Format Program -Version 3.0
System will reboot after successful format...

 Press 1 to initialize Drive B as 418 KB disk
 Press ESC to exit with no changes

>1
Flash Drive is now formatted
 Rebooting system...
```

EDIT.COM

A simple line editor is included to allow quick creation and modification of batch files or other text files. EDIT is similar to Microsoft's EDLIN provided in earlier versions of MS-DOS. It allows list, insert, delete, and modify. Upon exit, a backup of the original file is created (`filename.BAK`) and the edits are saved. If a backup file with the same name already exists, it is overwritten. A list of commands and their usage is available by entering 'h' at the edit prompt (>>). The name of the file to edit must be supplied following the command EDIT on the command line.

```
B:\>edit test.bat
FlashLite Line Editor v1.0
Enter h for help

New File: test.bat
>> i
      0: @echo Batch file being processed...
      1: mytsr
      2: myapp
      3: ^Z
>> l
      0: @echo Batch file being processed...
      1: mytsr
->    2: myapp

>> q
Save before exit (Y,n): y
File Saved
B:\>
```

DOS

JK microsystems' controllers use XDOS, a compact operating system for embedded applications. The XDOS command structure is nearly identical to MS/PC DOS version 3.3. The switches for the DIR command have been changed and expanded. XDOS does not support redirected input or output with the use of < and >, but does support pipes (|). None of the external DOS commands are available due to size constraints. XDOS does not support installable file system functions.

XDOS Command Reference

In the list below, XDOS commands are followed by a function description and their format including available parameters and switches. Items in boldface type must be entered. Capitals or lowercase letters may be used. Items in italics are parameters. Those in boldface italics must be entered, those in [ ] are optional. All switches are optional. They are shown as [/X]. Spaces and punctuation are to be included. An ellipsis ... following items means that you may repeat the items as often as needed. Do not enter the ellipsis or the square brackets. Most XDOS commands allow the use of wildcards in filenames and extensions. When wildcards (?=one character, *=any character or characters) are used, the command is executed once for each matching file.

Common parameters are:

[*d:*]	drive specification - a letter followed by a colon (:), e.g. A:, if no drive is specified, the default drive is used.
[*path*]	the path DOS must take in traveling from one directory to another; directory names are separated by a backslash (\).
[*filename*]	up to 8 characters used to name a file.
[.*ext*]	a three character extension may be added to a filename; an extension is separated from a filename by a period.

CD / CHDIR

Function: Changes the current directory
Format: **CD** or **CHDIR** [[*d:*]*path*]

COPY

Function: Copies a file, combines two or more files into one file
Format: **COPY** [*d:*][*path*]*filename*[.*ext*][*switches*]
[+[*d:*][*path*]*filename*[.*ext*][*switches*]
[*d:*][*path*][*filename*[.*ext*]][*switches*]
Switches: /V - verify the contents of new file
/A - copy file in ASCII format
/B - copy file in binary format

DATE

Function: Displays or changes the current DOS date.
Format: **DATE** [*mm-dd-yyyy*]

DEL / ERASE

Function: Deletes (erases) one or more files from a disk
Format: **DEL** or **ERASE** [*d:*][*path*][*filename*[.*ext*]]

DIR

Function: Lists directory entries
Format: **DIR** [*d:*][*path*][*filename*[*.ext*]][*switches*]
Switches: /a - display file attributes
/b - sort by file size (in bytes)
/d - sort entries by date and time
/f - display entries by alphabetic file name order
/n - display entries in directory order (do not sort)
/s - include system and hidden files in output
/p - stop at end of each page
/w - display only the file name
/h - display Help screen (any invalid key)

MD / MKDIR

Function: Creates a subdirectory
Format: **MD** or **MKDIR** [*d:*]*path*

PATH

Function: Specifies directories DOS will search when trying to locate executable files
Format: **PATH** [[*d:*]*path*[*;*[*d:*]*path ...*]]

PROMPT

Function: Sets the DOS system prompt
Format: **PROMPT** [*text*]
Text: Resulting Character(s):
$t The current time stored by DOS
$d The current date stored by DOS
$p The current directory
$v The version of DOS being used
$n The default drive
$g The character >
$l The character <
$b The character |
$q The character =
$$ The character $
$_ Carriage return plus line feed

REN

Function: Renames a file
Format: **REN** [*d:*][*path*]*filename*[.*ext*] *filename*[.*ext*]

RD / RMDIR

Function: Deletes a subdirectory
Format: **RD** or **RMDIR** [*d:*]*path*

TIME

Function: Displays or changes the current DOS time
Format: **TIME** [*hh:mm:ss.xx*]

TYPE

Function: Display the contents of a file
Format: **TYPE** [*d:*][*path*]*filename*[.*ext*]

VER

Function: Displays the DOS version number
Format: **VER**

VOL

Function: Displays the volume label of specified drive
Format: **VOL** [*d:*]

QuickBASIC/PowerBASIC Console I/O

Some of the code produced by Microsoft QuickBASIC compiler does not execute properly on the Flashlite. In the case of console I/O, we believe that QuickBASIC is generating code for specific hardware and software not present on the Flashlite.

There are two problems with console I/O. The first is that a PRINT statement will not send output to the console port. To output text to the console, open "cons:" as a file and print to it. The second problem is that an INPUT statement will not echo the data entered by the user. Workarounds for both of these problems can be found in the program BAS_INP.BAS on the utilities CD /Example subdirectory and shown here:

```
start:
      OPEN "o", 1, "cons:"
      PRINT #1, ""
      PRINT #1, "Quickbasic/PowerBasic Input Program"

      PRINT #1, "  Enter a string.........> ";
      GOSUB linein
      InputString$ = linein$
      PRINT #1, InputString$

      PRINT #1, "  Enter a numeric value..> ";
      GOSUB linein
      InputNumber = VAL(linein$)
      PRINT #1, InputNumber

      CLOSE 1
      END

linein:
      linein$ = ""
linemore:
      a$ = INKEY$
      IF a$ = "" THEN GOTO linemore
      IF a$ = CHR$(13) THEN GOTO linedone
      IF a$ <> CHR$(8) THEN GOTO getchar
      PRINT #1, CHR$(8); CHR$(32); CHR$(8);
      linein$=left$(linein$,(len(linein$)-1))
      GOTO linemore
getchar:
      PRINT #1, a$;
      linein$ = linein$ + a$
      GOTO linemore
linedone:
      PRINT #1, ""
      RETURN
```

Specifications

Supply Voltage: 7-34 VDC or 5 VDC +/- 5% regulated
Supply Power: 2W (nominal)
Operating Temperature: -20 to +85 °C
Humidity: 5 - 90 % non-condensing

Processor I/O Pin (PIO0, PIO1, PIO10, PIO11) Characteristics:

Symbol	Parameter	MIN	MAX	Units	Condition
V_{IL}	Input Low	-0.5	0.8	V	
V_{IH}	Input High	2.0	Vcc+0.5	V	
V_{OL}	Output Low		0.4	V	I_{OL}= 6mA
V_{OH}	Output High	2.4		V	I_{OH}= -6mA

Port A,B,C,D,E,F:

Symbol	Parameter	MIN	MAX	Units	Condition
V_{IL}	Input Low	0	0.8	V	
V_{IH}	Input High	2.0	5.5	V	
V_{OL}	Output Low		0.4	V	I_{OL}= 8mA
V_{OH}	Output High	2.4		V	I_{OH}= -4mA

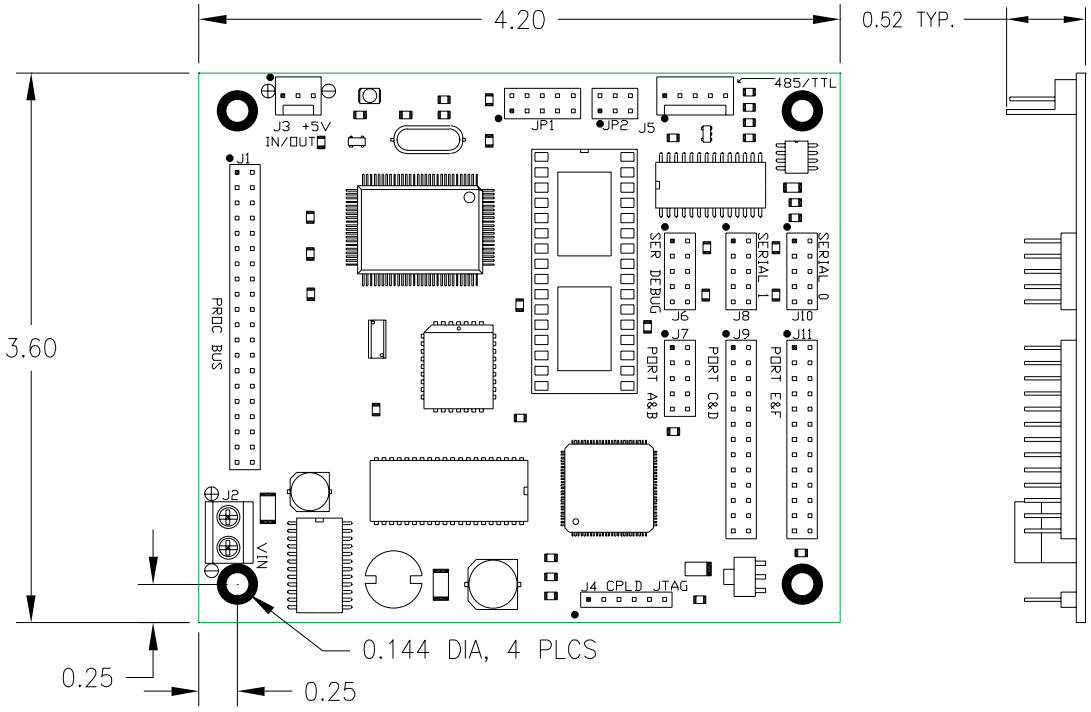
Mating Connectors:

Connector	Mfg	MFG P/N	JK micro P/N
2x5 Housing (J6, J7, J8, J10)	Molex	22-55-2101	28-0030
	Oupiin	4072-2X05H	
2x13 Housing (J9, J11)	Molex	22-55-2261	28-0031
	Oupiin	4072-2X13H	
Pins	Molex	16-02-0096	28-0033
	Oupiin	404-PIN-10K	
1x3 Housing, Friction Lock (J3)	Molex	22-01-2031	28-0012
	Oupiin	4071-03H	
1x5 Housing, Friction Lock (J5)	Molex	22-01-2051	28-0036
	Oupiin	4071-05H	
Pins, Friction Lock Housings	Molex	08-50-0114	28-0013
	Oupiin	4071-PIN-T	

Mechanical:

Dimensions 4.20" x 3.60" x 0.52"
106.7mm x 91.4mm x 13.2mm

Weight 2.1oz (59gm)


4.20
0.52 TYP.
3.60
0.25
0.25
0.144 DIA, 4 PLCS
J3 +5V IN/OUT
JP1
JP2
J5
485/TTL
J1
PROC BUS
SER DEBUG
J6
SERIAL 1
J8
SERIAL 0
J10
J7
PORT A&B
J9
PORT C&D
J11
PORT E&F
J2
VIN
J4 CPLD JTAG

Contact Information

JK microsystems, Inc.
1403 Fifth Street, Suite D
Davis, CA 95616

Telephone: (530) 297-6073
Fax: (530) 297-6074
Email: sales@jkmicro.com (sales inquiries)
support@jkmicro.com (technical support)
Web: http://www.jkmicro.com

M-Systems
DiskOnChip
39899 Balentine Drive, Suite 335
Newark, CA 94560

Telephone: (510) 413-5950
Fax: (510) 413-5980
Email: info@m-sys.com
Web: http://www.m-sys.com

Rev	Date	Author	Changes
1.4	17NOV03	EW	Add Flash write warning (p2), port load information (p6-7)
1.3	04NOV03	EW	Change J11 pin names (pin 5,9,10), table 2j pg 11
1.2	11JUL03	EW	Remove text implying PC compatibility of UART/Timer/PIC (p4) Fix note for JP2, had double negative (p9)
1.1	3FEB03	EW	Revise TOC, Table 2 references
1.0	30Jan03	EW	First Issue