

The Ethernet/Serial/Parallel expansion board combines a highly integrated, full function, IEEE 802.3 Ethernet controller with a dual 16C550 high speed UART with FIFO and bi-directional parallel port for users requiring local area network connectivity or additional peripherals. PC compatible serial and parallel ports provide additional I/O necessary for many demanding applications. The Ethernet port is a 16 bit design that supports direct connection to a 10BASE-T network, jumperless configuration, internal receive and transmit frame buffers, and other features that reduce CPU overhead and maximize throughput. These features added to the Flashlite386Ex yield a quick and cost effective solution for applications such as networking, embedded web and serial protocol conversion.

Features:

Ethernet:

- IEEE 802.3 Ethernet
- 10 MB/sec 10BASE-T
- RJ-45 Connector
- 16 bit interface
- Full duplex operation
- Automatic polarity detection/correction
- 4 Kbyte internal ram buffer
- Software configurable interrupt and port address
- Packet driver included

Serial ports:

- COM3 – wired as DTE (computer)
- COM4 – wired as DCE (peripheral)
- RS-232 signal levels
- 16C550 High Speed UART
- 16 Byte FIFO for each port
- Configurable Interrupts (3,4,5,6)
- 115kB maximum speed

Parallel port:

- Bi-directional
- DOS compatible as LPT1

System requirements:

- Flashlite386Ex SBC, BIOS version 3.0 or greater
- 40-pin bus cable
- 26-pin bus cable
- 10pin dual row to DB9F cable
- 26pin dual row to DB25F cable
- Stacking standoffs

Configuration:

The only configuration required is the setup of interrupts. To configure the serial port install jumpers on J7 as outlined below. Jumpers JP3 and JP4 on the Flashlite 386EX need to be verified as well. The serial port can be used without interrupt connections. The Ethernet controller is configured in software. The device defaults to IRQ9 but can be configured for IRQ5 or IRQ6. If IRQ5 or IRQ6 are used, JP3 or JP4 must be set properly on the Flashlite. Short JP4 1,2 for IRQ5 or JP3 1,2 for IRQ6. When configuring the COM ports, you must first select between IRQ 3/5 and IRQ 4/6, then select which COM port gets which IRQ. It is not possible to IRQ 3 and 5 or IRQ 4 and 6 simultaneously. The Ethernet controller requires an interrupt to function and cannot share an interrupt with the serial port or other peripherals.

	Expansion Card J7	Flashlite JP3	Flashlite JP4
COM3, IRQ3	Short 1,3	N/A	2,3
COM3, IRQ4	Short 3,5	2,3	N/A
COM3, IRQ5	Short 1,3	N/A	1,2
COM3, IRQ6	Short 3,5	1,2	N/A
COM3, interrupt disabled	1,3,5 open		
COM4, IRQ3	Short 4,6	N/A	2,3
COM4, IRQ4	Short 2,4	2,3	N/A
COM4, IRQ5	Short 4,6	N/A	1,2
COM4, IRQ6	Short 2,4	1,2	N/A
COM4, interrupt disabled	2,4,6 open		

Table 1: Jumper Configuration

Installation:

A 40-pin bus cable and a 26-pin bus cable are required to connect the expansion card to the Flashlite386 computer. If a card with only the serial/parallel ports is to be installed and interrupts are not used for the serial ports, the 26-pin cable is not required. Connect J1 on the Flashlite386 to J1 on the expansion and J13 on the Flashlite386 to J2 on the expansion card observing proper polarization of the cable. Mount the expansion card to the Flashlite386 using 7/8" stackable standoffs. Connect the serial, parallel, and Ethernet cables as required.

Cables:

COM3 is configured as a DTE port, and is generally used to communicate with a peripheral device. This port is electrically identical to COM1 on the Flashlite386 board. COM4 is configured as a DCE port, generally being used to connect the Flashlite386 to another computer. This port is electrically identical to COM2 on the Flashlite386 board. A 10pin dual row header to 9pin D-type connector may be required to connect the expansion card to a peripheral or computer. See the table 2a and 2b for connector pinouts.

LPT1 is configured for connection to a printer. This port can also be used for bi-directional I/O if desired. A cable connecting the 26pin dual row header to a 25pin D-type female connector may be required. See the table 2c for connector pinouts.

The Ethernet port will connect directly to a 10BASE-T network via the RJ45 jack. See the table 2d for connector pinouts.

The following tables show the signal name (direction) for each pin. N/C indicates no connection and PULLUP indicates a 1k Ω pullup resistor. Specified signal directions for the parallel port are for power on default and do not reflect any changes made by user software.

J5		COM3:	
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 2a: COM3 Pinout

J4		COM4:	
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 2b: COM4 Pinout

J6		LPT1:	
Strobe (out)	1	2	Auto Feed (out)
D0 (out)	3	4	Error (in)
D1 (out)	5	6	Initialize (out)
D2 (out)	7	8	Select (out)
D3 (out)	9	10	GND
D4 (out)	11	12	GND
D5 (out)	13	14	GND
D6 (out)	15	16	GND
D7 (out)	17	18	GND
Acknowledge (in)	19	20	GND
Busy (in)	21	22	GND
Paper Empty (in)	23	24	GND
Selected (in)	25	26	GND

Table 2c: LPT1 Pinout

J3		Ethernet
Pair 1	4,5	N/C
Pair 2	1,2	Transmit Data
Pair 3	3,6	Receive Data
Pair 4	7,8	N/C



Pin numbering on RJ45 cable plug

Table 2d: Ethernet Pinout

NOTE: Outputs refer to signals driven by the board and received by a peripheral. Inputs are driven by a peripheral and received by the board.

Software:

The serial and parallel ports are PC compatible. BIOS support is provided for the devices COM3, COM4 and LPT1. The COM3 base address is 3E8h and the COM4 base address is 2E8h. The parallel port address is 378h. Refer to Table 3 and 4 for basic serial/parallel register definitions and the TL16C552 data sheet for complete information regarding register definitions, programming the on-chip the FIFOs, and the bi-directional capabilities of the parallel port. NOTE: When using interrupts, bit 3 of the Modem Control Register must be high in order for UART interrupts (configured in the Interrupt Enable Register) to generate hardware interrupts.

	7	6	5	4	3	2	1	0
Base	Receive/Transmit holding Register							
	Data In, Data Out							
Base+1	Interrupt Enable Register (IER)							
	0	0	0	0	Modem Status	Receive Line Status	Transmit Holding Register Empty	Receive Data Ready
Base+2	Interrupt Identification Register (IIR)							
	RD	RX Trigger (MSB)	RX Trigger (LSB)	Reserved	Reserved	DMA Mode Select	Tx FIFO Reset	Rx FIFO Reset
WR	FIFOs Enabled	FIFOs Enabled				110=Line Status, 100=Rx Data 010=Transmit Buffer Empty 000=Modem Status		
Base+3	Line Control Register (LCR)							
	Divisor Latch Access	Send Break	Parity 000=None, 001= Odd, 011=Even 010=Mark, 111=Space			Stop Bits, 0=1, 1=2	Word Length 00=5, 01=6 10=7, 11=8	
Base+4	Modem Control Register (MCR)							
	0	0	0	Loop Back Test	Ext. Int. Enable	Out1	RTS	DTR
Base+5	Line Status Register (LCR)							
	Rx FIFO Error	Transmit Register Empty	Transmit holding reg.empty	Break Detected	Framing Error	Parity Error	Overrun Error	Receive Data Ready
Base+6	Modem Status Register (MSR)							
	DCD	RI	DSR	CTS	Δ DCD	Δ RI	Δ DSR	Δ CTS

Table 3: UART Registers

	7	6	5	4	3	2	1	0
Base	Data Register (read/write)							
	Data In, Data Out							
Base+1	Status Register (read-only)							
	Busy/	ACK/	Paper Empty	Selected	Error/	Print/	Reserved (1)	Reserved (1)
Base+2	Control Register (read/write)							
	Reserved (0)	Reserved (0)	Direction 0=output	Interrupt Enable	Select (output)	INIT/	AutoFeed	Strobe

Table 4: Parallel Port Registers

The Ethernet controller requires a software driver (included) to interface with network software or other programs. The supplied packet driver configures the chip interrupt, base address and other necessary parameters. The packet driver is called FLASHPKT.COM. Upload the required file to the Flashlite386 after installing the expansion board.

To install the packet driver, type:

```
B:\> FLASHPKT 0x60
```

The 0x60 is the software interrupt that programs will use to communicate with the driver. The number could be different, but 60h is common. The driver will install using the default interrupt (IRQ9) and I/O base address (300h) and will locate the MAC (Media Access Control) number stored in the BIOS. The user may specify a different interrupt, I/O address, or MAC number as required. For example:

```
B:\> FLASHPKT 0x60 0x300 5
```

will load the driver at software interrupt 60h, using 300h as the I/O address, and responding to IRQ5.

When the driver has loaded, it will indicate the media type (twisted pair), the system type (Flashlite386), software interrupt, port address and MAC number. The expansion board must be connected to a live network in order for the packet driver to install. The controller and driver perform several checks on the network media at startup in order to determine the optimum configuration.

After the driver has been installed, network software will be able to communicate with the Ethernet adapter and the network.

Users will probably want to modify their STARTUP.BAT file to load the packet driver when the board is powered up.

Applications:

Programming for the serial and parallel ports is the same as for a PC. Some care must be taken to configure the interrupts as described previously. The only departure from compatibility with standard PC/AT UART is the interrupt enable bit located in the MCR. These bits are set in the BIOS, but users must be sure they remain set if serial interrupts are used. FIFO features are not supported in the PC/AT UART. Example programs are available.

Some care is required when setting up the Flashlite386 on a network. Contact the Network Administrator if there are any questions about the required information. When working with a TCP/IP network, obtain the following information before starting your configuration: IP Address, Subnet mask, Name Server Address (DNS), and Gateway address. This information will be required during the configuration process. Other types of LANs require node names, workgroup names, etc. Proceed cautiously, networks can be easily disrupted when nodes are added without careful configuration.

The RJ-45 connector is configured to connect directly to a network hub with a straight through patch cord. For connection to a PC (without a hub), a crossover cable is required. This cable swaps the Tx and Rx pairs and is wired 1-3, 2-6, 3-1, 6-2. See Table 2d for plug pin numbering information.