Micro-Controller incorporates Web-Enabled, Real-time Operating System

DESCRIPTION

The Slim-Link family of Web Server-Controller products provides the ideal core technology for Internet enabled instruments and control systems. The Slim-Link Web Server Controllers are based on a 40 MHz AMD186ES micro-controller and feature MicroRTOS, a web enabled, real-time operating system developed spedifically for control system applications. MicroRTOS is embedded into each Slim-Link Web Server-Controller product with no additional cost or licensing fees.

MicroRTOS

MicroRTOS was created to simplify the process of designing a web enabled instrument or control system. This is accomplished by integrating a Preemptive Real-time Kernel, thin Web Server, and TCP/IP Stack into the fully-functioning operating system. The designer can then concentrate on the design of his application rather than integrating source codes from disparate applications. Three editions of MicroRTOS are available to support your application; the Basic edition, PPP Client Edition with Point-to-Point protocol for dial out applciations and the PPP Server Editon with Point-to-Point protocol for in bound dial-up applications.

Models

Six models of the **Slim-Link® Web Server-Controller** are currently offered. Each model is described below.

AWC86: Features the Basic Edition of MicroRTOS and 34 Digital I/O Lines

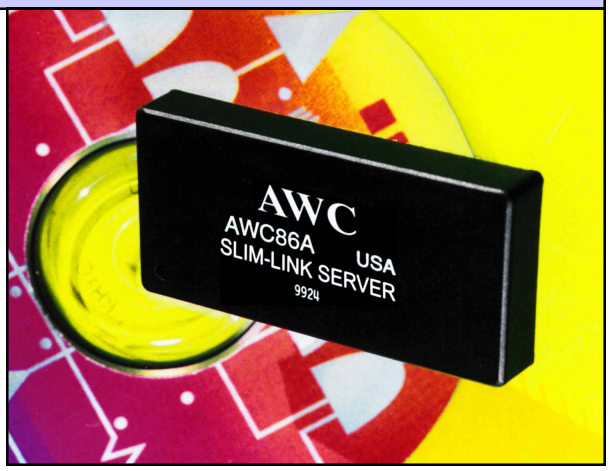
AWC86A: Features the Basic Edition of MicroRTOS with both Analog and Digital I/O Lines

AWC86C: Features the PPP Client Edition of MicroRTOS and 34 Digital I/O Lines

AWC86AC: Features the PPP Client Edition of MicroRTOS with both Analog and Digital I/O Lines

AWC86S: Features the PPP Server Edition of MicroRTOS and 34 Digital I/O Lines

AWC86AS: Features the PPP Server Edition of MicroRTOS with both Analog and Digital I/O Lines



CONTROLLER FEATURES

* Fully integrated microcontroller based on a 40 MHz AM186 Processor.
* 34 I/O function pins software selectable and configurable;
  - Two serial ports (RS232-TTL)
  - Eight 12-bit analog inputs; Two 12-bit analog outputs
  - Digital I/O, Timers, IRQs
* 512KByte Flash memory for user application code, Web page layouts and control data;
* 512KByte SRAM for run time code and data buffering
* Development kits available

MicroRTOS™ OPERATING SYSTEM FEATURES

* Multi-User, Multi-Task, Real-time Operation
* Preemptive real-time kernel for multi-tasking applications
* TCP/IP Stack supported by Ethernet datalink/physical layer
* Multi-user console tasks provides a user development and application platform

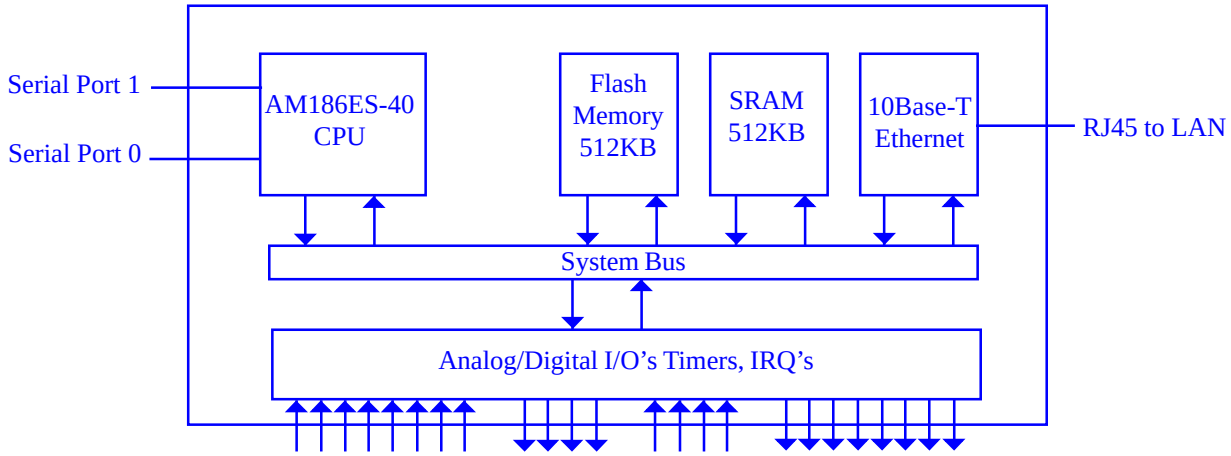
SOFTWARE DESIGN TOOLS

* Compatible with Borland Turbo C++ versions 3.0, 3.1, 4.5 and 4.52 and Microsoft Visual C++ Versions 1.0 to 1.52.

PACKAGING FEATURES

* Small size: 2.75" L x 1.38" W x 0.42” H
* Sturdy, encapsulated construction seals circuits from harsh environment;
* Industrial temperature range available (-40C to +85C)

Slim-Link® Server Functional Block Diagram

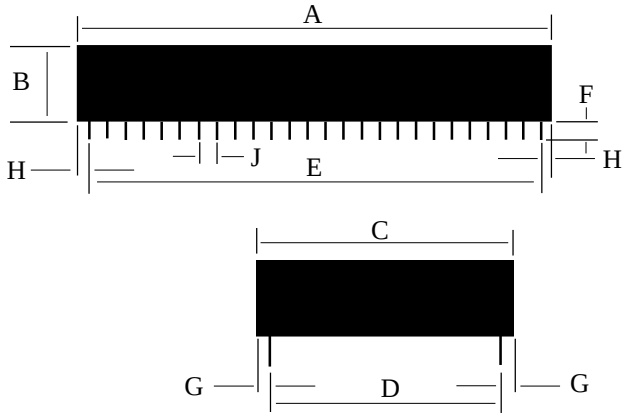


Slim-Link® Server Feature Table

FEATURE	AWC86	AWC86C	AWC86	AWC86A	AWC86AC	AWC86AS
CPU	AM186-ES	AM186-ES	AM186-ES	AM186-ES	AM186-ES	AM186-ES
Flash	512 KBytes	512 KBytes	512 KBytes	512 KBytes	512 KBytes	512 KBytes
RAM	512 KBytes	512 KBytes	512 KBytes	512 KBytes	512 KBytes	512 KBytes
Network I/F	10BASE-T	10BASE-T	10BASE-T	10BASE-T	10BASE-T	10BASE-T
Programmable I/O	26	26	26	22	22	22
Dedicated Digital Inputs	8	8	8	-	-	-
Analog Inputs	-	-	-	8	8	8
Analog Outputs	-	-	-	2	2	2
Real-Time Clock	N/A	N/A	N/A	Yes	Yes	Yes
MicroRTOS 2.0	Basic Edition	Client Edition	Server Edition	Basic Edition	Client Edition	Server Edition
TCP/IP Stack	Yes	Yes	Yes	Yes	Yes	Yes
PPP Client	No	Yes	No	No	Yes	No
PPP Server	No	No	Yes	No	No	Yes
Web Server	Yes	Yes	Yes	Yes	Yes	Yes
Telnet Server	Yes	Yes	Yes	Yes	Yes	Yes

Slim-Link® Server Mechanical Specifications

	INCHES		METRIC(MM)	
PIN	MIN	MAX	MIN	MAX
A	2.740	2.760	69.60	70.10
B	0.420	0.430	10.67	10.92
C	1.370	1.390	34.80	35.31
D	1.190	1.210	30.23	30.73
E	2.490	2.510	63.25	63.75
F	0.125	0.200	3.18	5.08
G	0.080	0.100	2.03	2.54
H	0.115	0..135	2.92	3.43
J	0.090	0.110	2.29	2.79



AWC86 and AWC86A Pin Configurations

AWC86

TD+	O 1		52 O	VCC	TD+	O 1	52 O	VCC
TD-	O 2		51 O	DIO21(TIN1)	TD-	O 2	51 O	DIO21(TIN1)
RD+	O 3		50 O	DIO20(TOUT)	RD+	O 3	50 O	DIO20(TOUT1)
RD-	O 4		49 O	DIO19(DT/R)	RD-	O 4	49 O	DIO19(DT/R)
			48 O	DIO18			48 O	DIO18
NSTAT	O 6		47 O	DIO17	NSTAT	O 6	47 O	DIO17
NXMT	O 7		46 O	DIO16(TOUT0)	NXMT	O 7	46 O	DIO16(TOUT0)
N/C	O 8		45 O	DIO15(TIN0)	N/C	O 8	45 O	DIO15(TIN0)
N/C	O 9		44 O	DIO14(INT5)	N/C	O 9	44 O	DIO14(INT5)
DIO0(TXDA)	O 10		43 O	DIO13(INT6)	DIO0(TXDA)	O 10	43 O	DIO13(INT6)
DIO1(RXDA)	O 11		42 O	DIO12	DIO1(RXDA)	O 11	42 O	DIO12
DIO2(/RTSB)	O 12		41 O	DIO11	DIO2(/RTSB)	O 12	41 O	DIO11
DIO3(/CTSB)	O 13		40 O	DIO10	DIO3(/CTSB)	O 13	40 O	DIO10
DIO4(TXDB)	O 14		39 O	DIO25	DIO4(TXDB)	O 14	39 O	D/A1
DIO5(RXDB)	O 15		38 O	DIO24	DIO5(RXDB)	O 15	38 O	D/A0
DIO6	O 16		37 O	DIO23	DIO6	O 16	37 O	MUXOUT
DIO7	O 17		36 O	DIO22	DIO7	O 17	36 O	ADCIN
DIO8(INT2)	O 18		35 O	DIN7	DIO8(INT2)	O 18	35 O	AIN7
DIO9(INT4)	O 19		34 O	DIN6	DIO9(INT4)	O 19	34 O	AIN6
NMI	O 20		33 O	DIN5	NMI	O 20	33 O	AIN5
INT1	O 21		32 O	DIN4	INT1	O 21	32 O	AIN4
INT3	O 22		31 O	DIN3	INT3	O 22	31 O	AIN3
CLKOUT	O 23		30 O	DIN2	Vref	O 23	30 O	AIN2
RESETOUT	O 24		29 O	DIN1	V.BAT	O 24	29 O	AIN1
/RESET	O 25		28 O	DIN0	/RESET	O 25	28 O	AIN0
GND	O 26		27 O	GND	DGND	O 26	27 O	AGND

AWC86A

Slim-Link® Server Pin Descriptions

Pin	Signal	Model	Description
1	TD+	All	TD+ is the positive lead of the 10Base-T transmit pair. The transmit pair presents an impedance of 100 ohms.
2	TD-	All	TD- is the negative lead of the 10Base-T transmit pair. The transmit pair presents an impedance of 100 ohms.
3	RD+	All	RD+ is the positive lead of the 10Base-T receive pair. The receive pair presents an impedance of 100 ohms.
4	RD-	All	RD- is the negative lead of the 10Base-T receive pair. The receive pair presents an impedance of 100 ohms.
5		All	No Pin
6	NSTAT	All	NSTAT is an active low output which indicates the status of the LAN connection to the Slim-Link® Server. A low indicates the LAN connection is active. The NSTAT output can sink up to 12 milliamps to drive an LED indicator.
7	NXMT	All	NXMT is an active low output. It goes low to indicate that the Slim-Link® Server is transmitting data onto the Local Area Network. The function of this signal can be altered in the Ethernet Controller's ISA Controller Status Register 7. The NXMT output can sink up to 12 milliamps to drive an LED indicator.
8	N/C	All	No Connection; reserved for future use.
9	N/C	All	No Connection; reserved for future use.
10	DIO0(TXDA)	All	This pin provides access to Programmable Input/Output 27 from the AMD186 controller. This I/O line can also be used as the Transmit Data input for Serial Port A. Hardware Flow Control is not available on Serial Port A.
11	DIO1(RXDA)	All	This pin provides access to Programmable Input/Output 28 from the AMD186 controller. This I/O line can also be used as the Received Data output for Serial Port A. Hardware Flow Control is not available on Serial Port A.
12	DIO2(/RTSB)	All	This pin provides access to Programmable Input/Output 20 from the AMD186 controller. This I/O line can also be used as the Request to Send output for Serial Port B. Request to Send is used for hardware flow control. The Slim-Link® Server deactivates Request to Send to stop the flow of data from the peripheral equipment.
13	DIIO3(/CTSB)	All	This pin provides access to Programmable Input/Output 21 from the AMD186 controller. This I/O line can also be used as the Clear to Send input for Serial Port B. Clear to Send is used for hardware flow control. When Clear to Send is inactive, the Slim-Link® Server will not transmit data to the peripheral equipment.
14	DIO4(TXDB)	All	This pin provides access to Programmable Input/Output 22 from the AMD186 controller. This I/O line can also be used as the Transmit Data input for Serial Port B.
15	DIO5(RXDB)	All	This pin provides access to Programmable Input/Output number 23 from the AMD186 controller. This I/O line can also be used as the Transmit Data input for Serial Port B.

Slim-Link® Server Pin Descriptions (continued)

Pin	Signal	Model	Description
16	DIO6	All	This pin provides access to Programmable Input/Output 24 from the AMD186 controller.
17	DIO7	All	This pin provides access to Programmable Input/Output 25 from the AMD186 controller.
18	DIO8(INT2)	All	This pin provides access to Programmable Input/Output 31 from the AMD186 controller. It also provides the input for Interrupt Request 2 to the Slim-Link® Server.
19	DIO9(INT4)	All	This pin provides access to Programmable Input/Output 30 from the AMD186 controller. It also provides the input for Interrupt Request 4 to the Slim-Link® Server.
20	NMI	All	This input provides access to the non-maskable interrupt to the microcontroller. This is the highest priority interrupt available on the Slim-Link® Server
21	INT1	All	INT1 provides the input for Interrupt Request 1 to the to the microcontroller.
22	INT3	All	INT3 provides the input for Interrupt Request 3 to the to the microcontroller.
23	CLKOUT	AWC86	This output provides the clock signal for the rest of the embedded control system in the AWC86. Depending upon the value set in the System Configuration Register of the AMD186 controller CLKOUT can be at 40 MHz, at the Power-Save frequency, or may be tri-stated. The Power-Save frequency is programmable from 1/2 (20 MHz) to 1/128 (312.5 KHz) of the system clock
	VREF	AWC86A	This input provides the reference voltage for the Slim-Link® Server analog inputs. VREF should not exceed VCC by more than 50 millivolts.
24	RESETOUT	AWC86	This output provides an active high reset pulse for the complete embedded control system. The duration of the reset pulse is typically 13 milliseconds. The reset pulse is sent each time power is applied to the AWC86 or the /RESET signal is driven low.
	V.BAT	AWC86A	This input the battery backup voltage for the AWC86A Real-Time Clock. A minimum of two volts must be maintained on VCC1 to maintain the Real-Time Clock.
25	/RESET	ALL	This input allows an the Slim-Link® Server to be reset from an external source. Reset must be held low for a minimum of one millisecond to initiate a Slim-Link Server reset.
26	DGND	ALL	DGND provides the reference ground for the Slim-Link® Server's Digital I/O signals.
27	GND	AWC86	This signal provides the reference ground for the AWC86 I/O signals.
	AGND	AWC86A	This signal provides the reference ground for the AWC86A Analog I/O signals.

Slim-Link® Server Pin Descriptions (continued)

Pin	Signal	Model	Description
28	DIN0	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 0. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN0	AWC86A	AIN0 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
29	DIN1	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 1. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN1	AWC86A	AIN1 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the ABD186 controller.
30	DIN2	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 2. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN2	AWC86A	AIN2 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
31	DIN3	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 3. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN3	AWC86A	AIN3 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
32	DIN4	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 4. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN4	AWC86A	AIN4 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
33	DIN5	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 5. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN5	AWC86A	AIN5 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
34	DIN6	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 6. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.

Slim-Link® Server Pin Descriptions (continued)

Pin	Signal	Model	Description
34	AIN6	AWC86A	AIN6 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
35	DIN7	AWC86	The AWC86 buffers this digital data input and passes it to the AMD186 Address and Data Bus bit 7. The buffer for this input is controlled by Programmable Input/Output 2 from the AMD186 controller.
	AIN7	AWC86A	AIN7 provides one of 8 analog input channels to the AWC86A. The integral Analog to Digital Convertor creates a serial digital representation and sends it to Programmable Input/Output 26 of the AMD186 controller.
36	DIO22	AWC86	This pin provides access to Programmable Input/Output 29 from the AMD186 controller.
	ADCIN	AWC86A	ADCIN provides the input to the Analog to Digital Convertor. This input is normally tied to the MUXOUT line.
37	DIO23	AWC86	This pin provides access to Programmable Input/Output 26 from the AMD186 controller.
	MUXOUT	AWC86A	MUXOUT is the output of the eight to one multiplexor which serves the eight Analog Input lines on the AWC86A. This output is normally tied to ADCIN.
38	DIO24	AWC86	This pin provides access to Programmable Input/Output 15 from the AMD186 controller.
	DA0	AWC86A	This pin provides one of the two analog outputs (VoutA) from the Digital to Analog Convertor Output integrated into the AWC86A. The digital data is supplied by Programmable Input/Output 26 from the AMD186 controller.
39	DIO25	AWC86	This pin provides access to Programmable Input/Output 3 from the AMD186 controller.
	DA1	AWC86A	This pin provides one of the two analog outputs (VoutB) from the Digital to Analog Convertor Output integrated into the AWC86A. The digital data is supplied by Programmable Input/Output 26 from the AMD186 controller
40	DIO10	ALL	This pin provides access to Programmable Input/Output 17 from the AMD186 controller.
41	DIO11	ALL	This pin provides access to Programmable Input/Output 16 from the AMD186 controller.
42	DIO12	ALL	This pin provides access to Programmable Input/Output 14 from the AMD186 controller.
43	DIO13(INT6)	ALL	This pin provides access to Programmable Input/Output 13 from the AMD186 controller. It also provides the input for Interrupt Request 6 to the Slim-Link® Server.
44	DIO14(INT5)	ALL	This pin provides access to Programmable Input/Output 12 from the AMD186 controller. It also provides the input for Interrupt Request 5.

Slim-Link® Server Pin Descriptions (continued)

Pin	Signal	Model	Description
45	DIO15(TIN0)	ALL	This pin provides access to Programmable Input/Output 11 from the AMD186 controller. It also provides the input for Timer 0.
46	DIO16(TOUT0)	ALL	This pin provides access to Programmable Input/Output 10 from the AMD186 controller. It also provides the output for Timer 0.
47	DIO17	ALL	This pin provides access to Programmable Input/Output 6 from the AMD186 controller.
48	DIO18	ALL	This pin provides access to Programmable Input/Output 5 from the AMD186 controller.
49	DIO19(DT/R)	ALL	This pin provides access to Programmable Input/Output 4 from the AMD186 controller. As DT/R, this controls the data flow through an external data-bus transceiver. When DT/R is high, the AMD186 transmits data; the AMD186 receives data when DT/R is low.
50	DIO20(TOUT1)	ALL	This pin provides access to Programmable Input/Output 1 from the AMD186 controller. It also provides the output for Timer 1.
51	DIO21(TIN1)	ALL	This pin provides access to Programmable Input/Output 0 from the AMD186 controller. It also provides the input for Timer 1.
52	VCC	ALL	Plus 5 Volt Power for the Slim-Link® Server

Slim-Link® Server Absolute Maximum Ratings

VCC	5.5 Volts
DC Input Voltage	-0.5 to +5.5 Volts
Storage Temperature Range	-20C to +100C
Operating Temperature Range	0C to 70C (-40C to +85C Available)
Lead Temperature During Soldering	260 C for 2 seconds maximum

Slim-Link® Server Power Supply Characteristics

Symbol	Parameter	Min	Typ	Max	Units
VCC	Supply Voltage	4.75	5.0	5.25	Volts
ICC	Supply Current		250		milliamps
V.bat*	Battery Voltage for Real-Time Clock	2.0	3.0	5.5	Volts
I.bat*	Battery Current Draw		0.2	0.3	microamps
Vref	A/D Reference Voltage	1.500	4.096	5.000	Volts

* External Battery Backup for Real-Time Clock

Slim-Link® Server I/O Characteristics

Digital I/O Signals

Signal	Mode	Maximum Voltage Low	Minimum Voltage High
Programmable I/O Lines[1, 2]	INPUT	0.8 Volts	2.0 Volts
	OUTPUT	0.45 Volts	2.4 Volts
Digital Input	INPUT	0.8 Volts	2.0 Volts
Interrupt Lines	OUTPUT	0.8 Volts	2.0 Volts
Reset	INPUT	0.8 Volts	2.4 Volts
NXMT	INPUT	0.8 Volts	2.4 Volts
NSTAT	OUTPUT	0.8 Volts	2.4 Volts

[1] DIO22, DIO23, DIO24, and DIO25 are not provided on the AWC86. On the AWC86A these signals are used to control analog inputs and outputs.

[2] DIO8, DIO9, DIO13, DIO14, include a 10K pull down resistor.

Analog I/O Signals (AWC86A only)

Signal	Mode	Maximum Voltage	Minimum Voltage
Analog Inputs	INPUT	-0.3 Volts	VCC+ .3 Volts
Analog Outputs	OUTPUT	0.0 Volts	4.096 Volts

Network Interface Signals

Signal	Description	Impedance for Line Pair	Maximum Loop Length
TD+	Ethernet 10Base-T Transmit Data Positive	100 Ohms Transmit Pair	100 Meters
TD-	Ethernet 10Base-T Transmit Data Negative	100 Ohms Transmit Pair	100 Meters
RD+	Ethernet 10Base-T Receive Data Positive	100 Ohms Receive Pair	100 Meters

Slim-Link® Server Local Area Network Connection

The Slim-Link® Server integrates a 10Base-T connection. An AMD AM79C961A Ethernet Controller is linked to the AMD186 main controller to handle the local area network interface. The AM79C961 provides both the Ethernet Control functions and 10Base-T transceiver facilities.

The integrated AM79C961A supports an IEEE 802.3 or ANSI 8802-3 compliant 10Base-T network connection. The ethernet controller handles all data framing, addressing and error detection tasks, and manages collision handling and avoidance.

The AM79C961A operates in Bus Master mode permitting it to directly address all memory locations. The fixed Ethernet Physical address is stored in an on-board EEPROM with other configuration data.

Slim-Link® Server Serial Ports

The Slim-Link® Server includes a pair of serial ports for local communications. These ports come directly from the AM186 controller. Serial Port B supports hardware flow control lines as well as transmit and received data. Serial Port A supports only transmit and received data.

Serial Port A
Serial Port A corresponds to Serial Port 1 of the AM186 micro-controller. Serial Port A includes only the TXD (Transmit Data) and RXD (Received Data) signals. These signals are active low.

Serial Port A does not support Hardware Flow Control. In-band flow control should be used instead. When using in-band flow control, predefined XON and XOFF characters serve as flow control signals from the controller and peripheral. The equipment places an XOFF character in the data stream when it can no longer accept data. An XON character is sent when data traffic can again be accepted.

Serial Port A Signal	AM186 Signal
TXDA	PIO27
RXDA	PIO28

Serial Port B
Serial Port B corresponds to Serial Port 0 of the AM186 micro-controller. Serial Port B includes hardware flow control lines RTS (Request to Send) and CTS (Clear to Send) as well as TXD (Transmit Data) and RXD (Received Data). All signals are active low.

The hardware flow control lines regulate the flow of data between the Slim-Link® Server and its serial peripheral. When both devices can receive data the RTS and CTS lines remain active. The Slim-Link® Server should keep RTS active as long as it can accept data from the peripheral equipment. It should drop RTS to signal the peripheral equipment that it cannot accept data on RXD. The peripheral equipment will likewise manipulate CTS to indicate when it is unable to accept data on TXD.

Serial Port B Signal	AM186 Signal
TXDB	PIO22
RXDB	PIO23
RTSB	PIO20
CTSB	PIO21

AWC86A Analog Outputs

The AWC86A includes two Analog Output pins. These outputs are supported by a 12-bit internal digital to analog convertor within the Slim-Link Server. Three of the AM186 Programmable Input/Output lines are used to support this function.

Digital to Analog Convertor

The Digital to Analog Convertor converts 24-bit serial data bytes into two analog output signals. The serial data is transmitted synchronously from the AM186 controller to the Digital to Analog Convertor. The first 12 bits define the level at DA0; the remaining 12 bits define the level at DA1. The maximum output voltage on either analog output is 4.095 volts, the Least Significant Bit equals 1 millivolt.

The three signals which control the integral Digital to Analog Convertor are PIO3, PIO26 and PIO29. Serial data is presented to the digital to analog convertor on PIO26. The serial data clock is presented by PIO3. PIO3 controls the flow of data within the Digital to Analog Convertor. PIO3 low permits the serial data to be clocked into the input shift register. When PIO3 is high data is transferred from the shift register to the DAC Registers and updates the DA0 AND DA1 outputs.

AWC86A Analog Input Lines

The Slim-Link® Server is available with 8 Analog Input pins, AWC86A only. These inputs feed into a common 12-bit Analog to Digital Convertor, ADC. Three of the Programmable Input/Output lines from the AMD186 support these analog inputs.

Analog to Digital Convertor, ADC

An integral Analog to Digital Convertor converts the analog inputs to a serial digital data stream. The maximum sampling rate of the ADC is 16.8 KHz. The ADC provides 12-bit resolution; the least significant bit equals .00122 volts.

The AWC86A multiplexes all eight analog inputs into a single ADC under the control of the AMD186 controller. With Programmable Input/Output 2 high the AMD186 controller sends the 4-bit multiplexor address on Programmable Input/Output 26. When Programmable Input/Output 2 is low, serial data flows from the ADC to the AMD186 controller on Programmable Input/Output 26. The synchronizing clock for the data is provided by the AMD186 on Programmable Input/Output 29.

Analog Channel Selection

As mentioned above, a 4-bit word is issued by the AMD186 controller to select the analog channel. The logic table below shows how each channel is addressed.

Selected Channel	EN (bit 3)	D2 (bit 2)	D1 (bit 1)	D0 (bit 0)
All Off	0	x	x	x
Ch 0	1	0	0	0
Ch 1	1	0	0	1
Ch 2	1	0	1	0
Ch 3	1	0	1	1
Ch 4	1	1	0	0
Ch 5	1	1	0	1
Ch 6	1	1	1	0
Ch 7	1	1	1	1

AWC86A Real-Time Clock

The AWC86A version of the Slim-Link® Server incorporates a Real-Time Clock. The Real-Time Clock tracks month, date, year, day, hours, minutes and seconds. Applying a battery voltage to Pin 24 permits the Real-Time Clock to maintain the time when power is shut down to the AWC86A.

The Real-Time Clock interfaces to the AM186 controller through Programmable Input/Output lines 15, 26, and 29. PIO15 controls the Real-Time Clock Reset. Reset must be high during serial communications and should be held low otherwise. PIO26 provides the serial data path to the Real-Time Clock. PIO29 provides the serial clock which synchronizes the data exchange with the AM186. Data sent to the Real-Time Clock is read on the Trailing edge of the serial clock; data is sent from the Real-Time Clock on the failing edge of the serial clock. Clock frequency should be no greater than 2 MHz.

The Real-Time Clock stores Clock/Calendar data in seven registers. Other registers store control information and access a thirty byte RAM. Data can be read or written from the Real-Time Clock one register at a time or multiple registers may be addressed in a single burst.

Command Byte:
A command byte precedes each data transfer in the Real-Time Clock. The bit mapping of the 8-bit command byte is shown below.

Bit 7 - Most Significant Bit, Always 1

Bit 6 - 0 - Clock/Calendar Data
1 - RAM Data

Bits 1-5 - Register Address

Bit 0 - 0 - Write to Real-Time Clock
1 - Read from Real-Time Clock

Clock/Calendar Registers:
Seven registers store the clock and calendar information for the Real-Time Clock. Each of these registers is described below.

Seconds: Register Address 00000
This register stores the second count in BCD form. The Clock Halt Flag is stored in bit seven. When this flag is set the clock's oscillator is stopped.

Minutes: Register Address 00001
This register stores the minute count in BCD form.

Hours: Register Address 00010
This register stores the hour count in BCD form. Bit seven selects whether a 12-hour or 24-hour clock will be used. A 1 selects a 12-hour clock. When a 12-hour clock is used bit 5 stores AM/PM status.

Date: Register Address 00011
This register stores the Date in BCD form.

Month: Register Address 00100
This register stores the month in BCD form.

Day: Register Address 00101
This register stores the day in BCD form.

Year: Register Address 00110
This register stores the year in BCD form.

Write Protect Register:
Register address 00111 provides write protection for the Clock/Calendar Registers. New values cannot be written into these registers if bit seven of the Write Protect Register is set.

Trickle Charge Register:
The AWC86A can charge the battery used to backup the Real-Time Clock. The Trickle Charge Register, address 0100, controls the function. The bit-mapping of this register is shown below. The remaining bits set the maximum charging current as shown below.

Bit	0	1	2	3	Max. Charge Current*
	0	1	0	1	2.2 milliamps
	0	1	1	0	1.1 milliamps
	0	1	1	1	0.55 milliamps
	1	0	0	1	1.8 milliamps
	1	0	1	0	0.9 milliamps
	1	0	1	1	0.45 milliamps

* All register settings not shown are invalid.

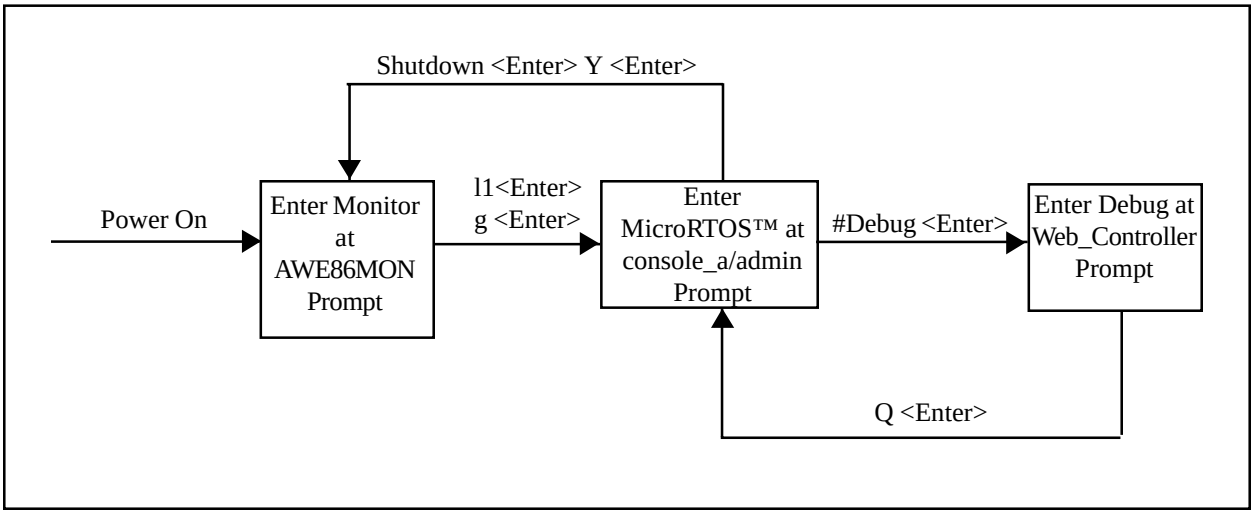
Clock Burst Register:
The Clock Burst Register, address 01111, allows the seven Clock/Calendar Registers and the Write Protect Register to be addressed with a single, continuous data string.

RAM Burst Register:
The RAM Burst Register, address 11111, allows all thirty of the RAM registers to be addressed with a single, continuous data string.

Slim-Link® Server Interactive Command Modes

The Slim-Link® Server includes three Interactive command modes: AWE86MON Monitor and MicroRTOS™ Real-Time Operating System are included in the Slim-Link Server module. The MicroRTOS™ Debug Utility is available as a User Command. The AWE86Mon is an enhanced version of the AMD 186 Monitor for the AM186ES-40 Microcontroller. MicroRTOS™ is Advanced Web Communication's proprietary multi-user real-time operating system. The MicroRTOS™ Debug Utility permits designers to manipulate MicroRTOS™ features for applications development. If the Debug Utility is loaded into Flash memory, it can be accessed with the #Debug command. The table below shows how the developer moves between these three command modes.

Command Modes Flow Chart



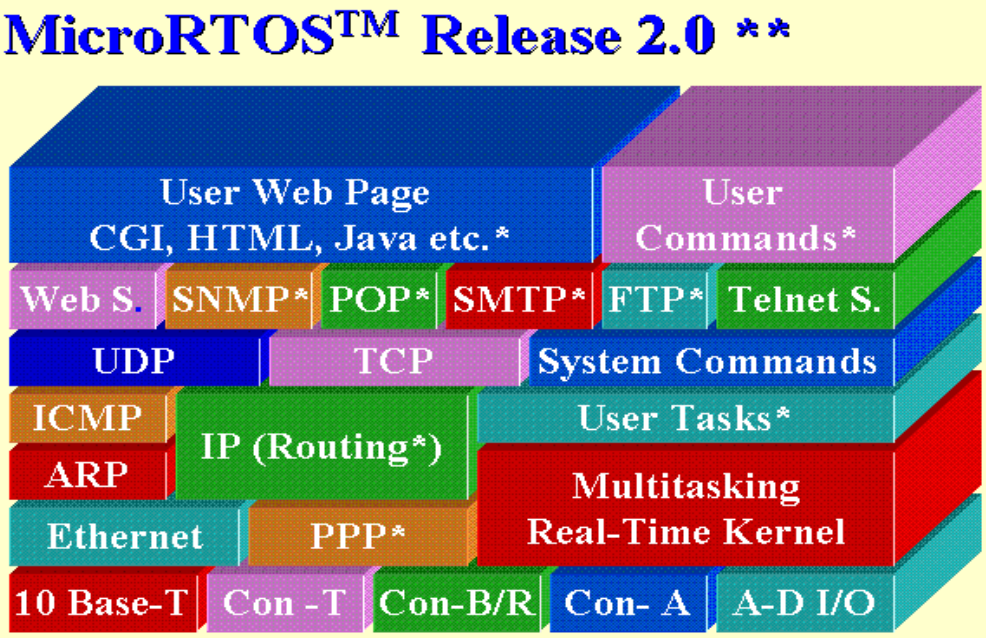
AWE86MON Monitor Commands

The Slim-Link® Server includes a 186 micro-controller monitor utility in firmware. This monitor program permits the developer to manipulate memory contents, execute and debug application programs through either of the Slim-Link® Server's serial ports. Control is provided through the commands listed below. These commands must be issued in ten-bit character format (8 data bits, no parity). The Slim-Link® Server will auto baud at data rates from 300 to 115,200 bits per second when an "a" is received in the first 3 seconds after power is applied.

Command	Format	Description
B	B[Addr]	Set Break Point at listed address
C	C [Range, Addr]	Compare contents of listed memory Range with the contents beginning at the listed Address.
D	D [Start Addr, End Addr]	Display contents of the specified range of Memory Locations.
E	E [Addr, List}	Load data from list into memory beginning at the Memory Address shown.
F	F [Range, List]	Fills locations in the listed Memory range with the listed values.
G	G [Addr]	Activate program with the start address shown
H	H	Help, display AWE86MON monitor commands
I	I	List System Information
I	I[Word]	Input word from serial port
J	J	Automatically determine new baud rate
L	Ln	Load file n
M	M [(Start Addr, End Addr), New Addr]	Move data in memory range to new location beginning with New Memory Address
N	N[Argument List]	List all .exe arguments
O	O [Word]	Output Word to serial port
P	P [Parameter, Value]	Load Value into selected Parameter. Parameters include baud rate setting, cpu speed to Monitor, automatically run selected file, monitor port, and protect flash memory.
R	R [Register Name]	Display Register value
S	S[(Start Addr, End Addr), List]	Search for the Listed data within the range of Addresses given.
T	T [address, word]	Step through the execution of the program beginning at the selected Address or Word.
W	W [Name]	Write hex file Name into Flash Memory
X	X [Sector]	Erase selected Sector of Flash memory
Z	Z	Upgrade Boot Monitor, Replace the Monitor in Flash Memory, or Lock the Monitor into RAM.

Slim-Link® Server Multi-User, Multi-Task Real-Time Operating System

MicroRTOS™ Version 2.0 Diagram



The Slim-Link® Server operates with MicroRTOS™, Multi-User, Multi-Task Real-Time Operating System. This operating system permits the Slim-Link Server to support multiple users and to run multiple tasks simultaneously in real-time. Multiple users can be connected to either serial port or over the ethernet connection to the HTTP server.

MicroRTOS™ includes a preemptive real-time kernel to permit simultaneous support of multiple tasks. Up to 64 tasks can be managed. The tasks are juggled based on their assigned priority level.

MicroRTOS™ handles network communications through the TCP/IP stack and Ethernet link. Both Ethernet's datalink and physical layers are contained within the Slim-Link® Server module. The TCP/IP stack includes the Transport Control Protocol, Internet Protocol, User Datagram Protocol, Internet Control Message Protocol, and Address Resolution Protocol. In the future additional protocols will be added to the TCP/IP stack.

Descriptions of the operating system commands appear on the following page. Only the first 3 letters of each command need to be entered and the commands are not case sensitive. Each command is terminated by striking the "Enter" key.

MicroRTOS™ COMMANDS

Command	Format	Description
?	?	Causes the Slim-Link® Server to list the operating system commands
Adduser	ADD<cr>	Allows the Root user to create a new user account
ARP	ARP<cr>	Causes the Slim-Link® Server to list the last 10 IP and Ethernet addresses
Buffer	BUF<cr>	Checks the data bufer usage and permits selective clearing of the data buffer. This command can only be executed by the Root user.
Deluser	DEL<cr>	Allows the Root user to delete an existing user account
Dir	DIR<cr>	Causes the Slim-Link® Server to list all of the files in both SRAM and Flash memory. It also shows the total amount of memory used for these files.
Erase	ERA[file]<cr>	Marks the listed file as erased although the file remains resident in Flash Memory until the memory sector is erased. This command can only be executed by the Root user.
Exit	EXI<cr>	Causes the Slim-Link® Server to exit operating system and return to the XE186 Monitor.
Host	HOS<cr>	Causes the Slim-Link® Server to list the latest IP host sites visited
Level	LEV<cr>	Allows the Root user to check command security levels and make alterations as required.
Login	LOG<cr>	Allows a user to log into the system
Password	PAS<cr>	Allows the user to change their password. A Root user may change any users password.
Ping	PIN [IP Address] <cr>	Causes the Slim-Link® Server to send out a test call to the listed IP Address and report on the successful response.
PPP	PPP<cr>	In the PPP Client Edition this command causes the Slim-Link® Server to display the loaded ISP parameters.
Reboot	REB<cr>	Allows the Root user to initialize a system reboot.
Resume	RES[priority]<cr>	Allows the Root user to resume a suspended task.
SetIP	SET<cr>	Allows the user to read, and if desired change, the Slim-Link® Server's IP configuration.
Shutdown	SHU<cr>	Initiate a shutdown of MicroRTOS. This command can only be executed by a Root user from Console_A.
Status	STA<cr>	Causes the Slim-Link® Server to report on the status of the operating system, HTTP Server, and Serial Ports.
Stop	STO[priority]<cr>	Allows the Root user to Suspend the the listed task.
Task	TAS<cr>	Causes the Slim-Link® Server to list the tasks currently in memory. The list includes the assigned priority and size of each task.
Telnet	Tel[on/off]<cr>	Allows the Root User to select or deselect the Telnet Server Function.
Time	TIM<cr>	Causes the Slim-Link® Server to report the date and time stored in the on board real-time clock and permits the user to set a new date and time. This command is only supported by the AWC86A module.
User	USE<cr>	Displays the user list and allows the Root user to change user priority levels.
Version	VER<cr>	Displays the MicroRTOS Version level
Web	WEB[ON/OFF/Status]<cr>	Controls the Web Server status of the Slim-Link® Server. This command can only be executed by a Root user
<TAB>	<tab>	Striking the TAB key causes the Slim-Link® Server to re-execute the last operating system command.

Slim-Link® Server Debug Utility Commands

A Debug utility can be loaded in the Slim-Link Server's Flash memory. This Debug program permits the developer to exercise Flash Memory, the Real-Time Clock, Analog to Digital Convertor, and Digital to Analog Convertor through either of the Slim-Link® Server's serial ports. The file debug.cmd must be loaded into the MicroRTOS system subdirectory in the Slim-Link Server's Flash memory. The Debug Utility provides the commands listed below. These commands must be issued in ten-bit character format (8 data bits, no parity) at 38,400 bits per second.

Command	Format	Description
A/D	A/D	Read the values on each of the 8-Channels of the Analog to Digital Convertor. This command is available only on the AWC86A.
C	C [Start Addr, End Addr]	Compare listed Memory Locations
D	D [Start Addr, End Addr]	Display contents of memory in the selected range
D/A	D/A	Convert Digital Inputs to Analog Value. This command is available only on the AWC86A.
E	E [Start Addr, List new values]	Enter new values beginning with selected memory address.
F	F [(Start Addr, End Addr), List new values]	Fill Memory Range with Listed values
H	H	Help! List Monitor Commands
I	I[Word]	Input Word
M	M [(Start Addr, End Addr), New Addr]	Move data in memory range to new location beginning with New Memory Address
O	O[Word]	Output Word
Q	Q	Quit MicroRTOS™ Debug utility and Return to MicroRTOS™
S	S [(Start Addr, End Addr), List Value]	Search range of addresses for listed value

Slim-Link® Server HTTP Server

The Slim-Link® Server includes an HTTP Server to support user web pages. The Slim-Link® HTTP Server is compatible with all currently popular Web Browsers including Internet Explorer and Netscape. The Slim-Link® HTTP server can dynamically create Web pages using the Common Gateway Interface(CGI) to show system status or process data.

A sample web page is included in the Slim-Link® Server embedded firmware. Developers can modify the firmware to quickly develop a Web Page to suit their application.

Slim-Link® Server TCP/IP Stack

The Slim-Link® Server includes an embedded TCP/IP Stack to support Internet Communications. This stack is illustrated below using the OSI architechure model. TCP/IP includes four clearly defined layers; Application, Transport, Network, and Data Link. The presentation and session layers have been bypassed by TCP/IP.

Layer	Definition	Embedded in Slim-Link® Server
7	Application	Web Server / Telnet Server / PPP / SMTP / SNMP
4	Transport	TCP / UDP
3	Network	IP / ICMP
2	Data Link	ARP / Ethernet / PPP
1	Physical	10Base-T

Protocol	Definition	Description
TCP	Transport Control Protocol	The Transport Control Protocol provides the means to insure that internet communications are reliable.
UDP	User Datagram Protocol	The User Datagram Protocol facilitates the communication from one machine to another.
IP	Internet Protocol	The Internet Protocol performs three functions in internet communications: It defines the format of all data. It performs routing of the data through the network. I defines how hosts an routers should process the data packets.
ICMP	Internet Control Message Protocol	The Internet Control Message Protocol allows routers on the internet to report errors and unexpected occurrences.
ARP	Address Resolution Protocol	The Address Resolution Protocol increases internet efficiency by binding together machine IP addresses.
PPP	Point to Point Protocol	Point ot Point Protocol permits the transport of datagrams over a point to point link such a analog modem connection.
10Base-T	IEEE 802.3	10Base-T Ethernet provides a 10 Mbps communications bus over a twisted wire pair.

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