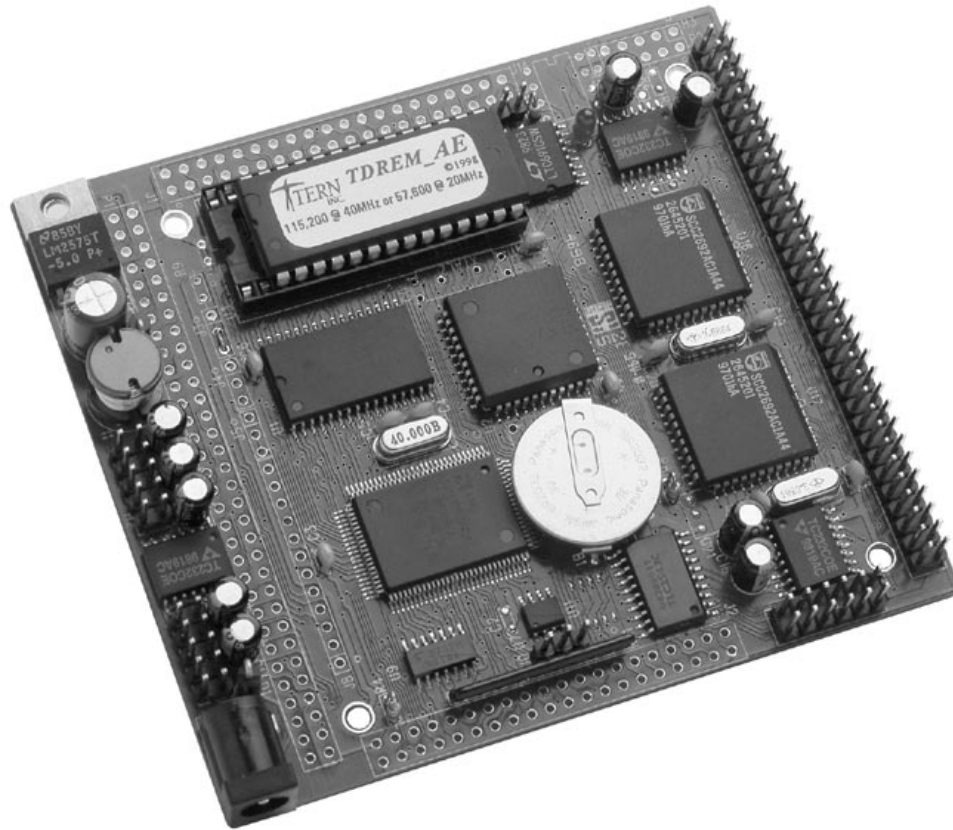


A104S™

PC/104 Controller with 7 Serial Ports, 80+ I/Os, ADC, DAC,
Solenoid Drivers and LCD interface
Based on the Am188ES



Technical Manual



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1.1 Introduction

The **A104S** is a 16-bit PC/104 form factor microcontroller based on the original **A104** design. Measuring 4.0 by 3.6 by 0.5 inches, the **A104S** offers a complete C/C++ programmable computer system with a 16-bit, high performance CPU (Am188ES, AMD), operating at 40 MHz system clock with zero-wait-state. The **A104S** supports PC104 expansion, 24 TTL bi-directional I/O pins, seven TTL outputs, 11 channels of 12-bit ADC, two channels of 12-bit DAC, up to six channels RS-232 and one channel RS485, a real-time clock, battery backup, watchdog timer, PWM, three timer/counters, a 512-byte serial EEPROM, up to 512 KB SRAM, and up to 512 KB ROM/Flash.

The **A104** is designed for control applications that require PC/104 expansion, precision analog conversion, solenoid drivers, and high-speed performance. The **A104S** is designed around the PC/104 industry standard to interface to PC/104 peripherals. For precision analog conversion the **A104S** supports an 11 channel 12-bit ADC.

Two asynchronous serial ports from the Am188ES support reliable DMA-driven serial communication at up to 115,200 baud with RS-232 drivers. An optional UART SCC2691 (RS-485) and two dual UARTs SCC2692 (RS-232) can be added for an additional five asynchronous serial ports.

An optional real-time clock provides information on the year, month, date, hour, minute, second, 1/64 second, and an interrupt signal.

Three 16-bit programmable timers/counters are on board. Two timers can be used to count or time external events, up to 10 MHz, or to generate non-repetitive or variable-duty-cycle waveforms as PWM outputs. Pulse Width Demodulation (PWD), a distinctive feature, can be used to measure the width of a signal in both its high and low phases. It can be used in many applications, such as bar-code reading. The 32 I/O pins on the Am188ES are multifunctional and user-programmable. You may have 15 or more lines free to use, depending on your application.

The 82C55 I/O chip on-board provides an additional 24 bi-directional I/O lines, of which 14 TTL user-definable I/O lines can be used to interface to a graphic- or character-type LCD and a keypad. An adjustable negative voltage (-10V) may optionally be installed on-board for LCD contrast.

A supervisor chip with power failure detection, a watchdog timer, an LED, and expansion ports are on board. The optional 12-bit ADC has 11 channels of analog inputs with sample-and-hold and a high-impedance reference input. The ADC conversion rate is up to a sample rate of 10 KHz. Four operational amplifiers provide differential analog signal conditioning with variable configurable gain for ADC channels 0-3 at the screw terminal. The remaining seven ADC analog inputs' range is single-ended 0-5V (or 0 to REF). One DAC chip may be installed on-board to provide two channels 12-bit, 0-4.095V analog voltage outputs capable of sinking or sourcing 5 mA.

If the 12-bit ADC chip is not installed, a PAL (TDP100) can be installed in the ADC socket to provide eight digital inputs.

By default, 5V linear regulator (8.5-12V DC input) is installed. A 5V switching regulator (up to 35V DC input) may be installed to reduce power consumption and heat. The switching regulator introduces more noise than a linear regulator.

A MemCard-A can be installed on the **A104S** to provide an additional 33 12-bit ADC, 6 24-bit ADC, 420 MB PCMCIA memory, and an Ethernet interface.

Features:

Standard Features

- Dimensions: 4.0 x 3.6 x 0.5 inches
- Easy to program in C/C++
- Power consumption: 160/120/60 mA at 9/12/24V
- Power input: +8.5V to +12 V unregulated DC with linear regulator
or, +8.5 to +35V unregulated DC with switching regulator (optional)
- Temperature: -40°C to +80°C
- 16-bit CPU (Am188ES), Intel 80x86 compatible, 40 MHz
- High performance, zero-wait-state operation at 40 MHz
- Up to 512KB Flash/ROM
- 2 high-speed PWM outputs and Pulse Width Demodulation
- 24 additional bi-directional I/O lines from 82C55
- 512-byte serial EEPROM
- 6 external interrupt inputs, 3 16-bit timer/counters
- 2 CPU serial ports
- Supervisor chip (691) for power failure, reset and watchdog
- 7 TTL outputs plus 14 TTL I/Os for Graphic/character LCD or keypad interface
- PC/104 bus
- Up to 420 MB memory expansion with PCMCIA via the **MemCard-A**

Optional Features:

- 32KB, 128KB, or 512KB SRAM
- 11 channels of 12-bit ADC, sample rate up to 10 KHz (TLC2543)
- 2 channels of 12-bit DAC, 0-4.095V output
- SCC2691 UART (on-board) with RS-485 drivers
- Up to 2 SCC2692 dual UARTs with RS-232 drivers
- Real-time clock RTC72423, lithium coin battery
- Precision reference, 20 PPM/°C, 5V
- LCD negative voltage port
- 68-pin 8-bit PC/104 connector

1.2 Hardware

UART SCC2692

The two dual UARTs (SCC2692, Signetics, U16 and U17) are 44-pin PLCC chips. U16 is mapped into the I/O address space at **0x300**, and U17 is at **0x200**. The SCC2692 includes two independent full-duplex asynchronous receiver/transmitters, a quadruple buffered receiver data register, an interrupt control mechanism, programmable data format, selectable baud rate for the receiver and transmitter, a multi-functional and programmable 16-bit counter/timer, an on-chip crystal oscillator, and a multi-purpose input/output including RTS and CTS mechanism.

A 3.6864 MHz external crystal can be installed as the default crystal for the dual UART.

For more detailed information, refer to the SCC2692 data sheets (Signetics tel. 408-991-3737).

Only RS-232 drivers are provided for the dual UARTs. The RS-232 signals are routed to the P2 header.

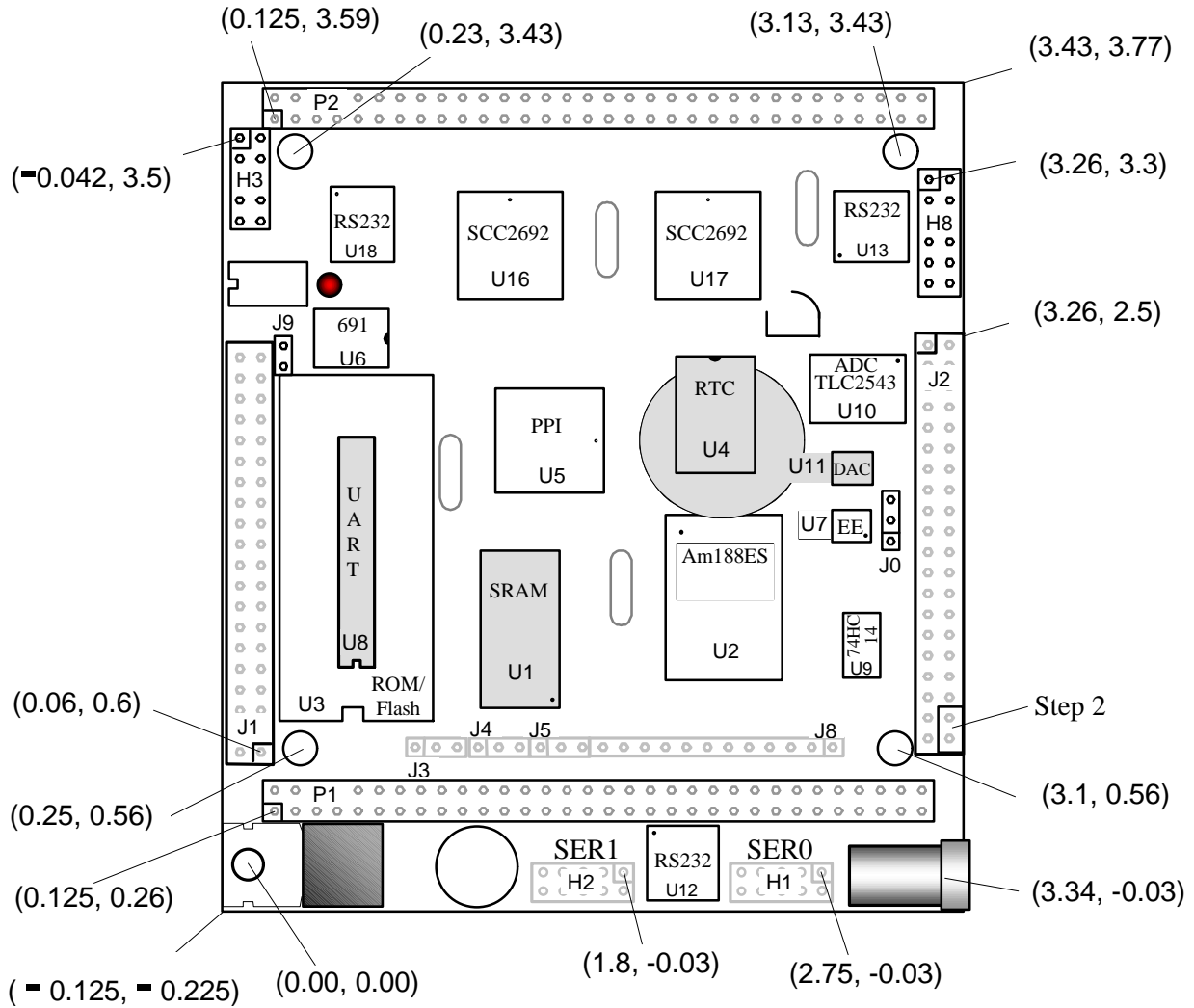
Sample programs for the A104S are listed in the `c:\tern\186\samples\a104s` directory.

Please refer to the *A104 Technical Manual* for information on all other components.

A104S Layout

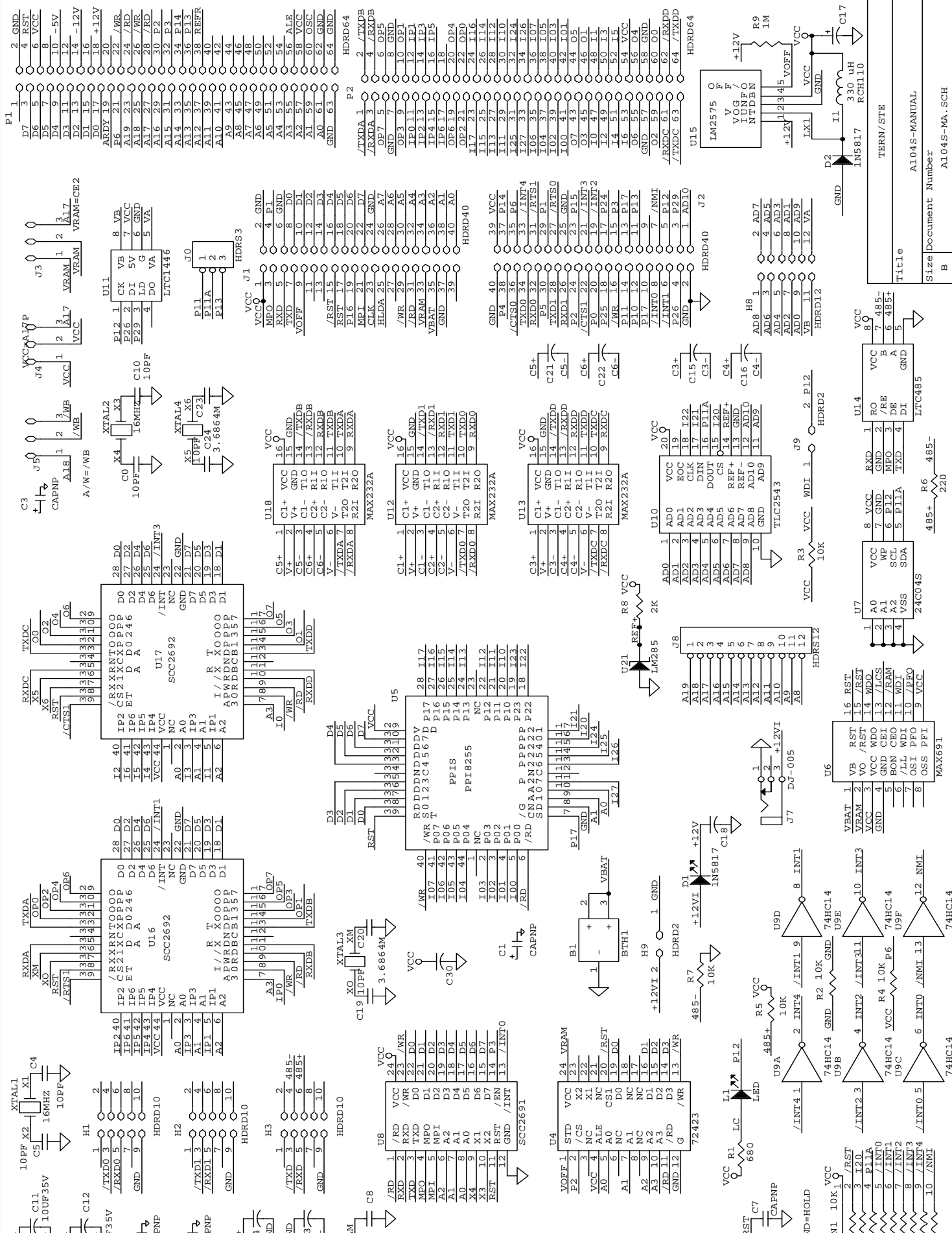
September 6, 2000

The A104S measures 4.0 x 3.6 inches. All dimensions shown below are in inches.



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