

TB-1 TRAINING BOARD Technical Manual

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WARRANTY:

BiPOM Electronics warrants TB-1 Training board for a period of 1 year. If the Kit becomes defective during this period, BiPOM Electronics will at its option, replace or repair the Kit. This warranty is voided if the product is subjected to physical abuse or operated outside stated electrical limits. BiPOM Electronics will not be responsible for damage to any external devices connected to the Kit. BiPOM Electronics disclaims all warranties express or implied warranties of merchantability and fitness for a particular purpose. In no event shall BiPOM Electronics be liable for any indirect, special, incidental or consequential damages in connection with or arising from the use of this product. BiPOM's liability is limited to the purchase price of this product.

TABLE OF CONTENTS

1. OVERVIEW	4
2. SPECIFICATIONS	4
3. FUNCTIONAL BLOCKS	5
4. BOARD LAYOUT	7
5. SCHEMATIC	8

1.Overview

Training Board TB-1 is an experimentation board that illustrates the many capabilities of the BiPOM Electronics micro-controller boards. TB-1 features

- 3 Traffic light LED's (red, yellow, green)
- 2 interrupt inputs
- 2 switch inputs (in parallel with interrupt inputs)
- 2 timer/counter inputs
- 4 channels of 8-bit analog inputs
- Programmable buzzer
- Expansion bus to other boards

2.Specifications

Dimensions are 2.35 X 2.40 inches (5.97 X 6.10 centimeters).

Mounting holes of 0.125 inches (3 millimeters) on four corners.

0° - 70° C operating, -40° - +85° C storage temperature range

3.Functional Blocks

Expansion

TB-1 is connected to MINI-MAX/51-C and other boards through the Expansion Connector (J1).

Table 1 shows the pin assignments for the Expansion Connector.

Expansion (J1)

Signal	Pin	Pin	Signal
P3.0	20	19	P3.1
P3.2	18	17	P3.3
P3.4	16	15	P3.5
P3.6	14	13	P3.7
P1.0	12	11	P1.1
P1.2	10	9	P1.3
P1.4	8	7	P1.5
P1.6	6	5	P1.7
VCC	4	3	GND
VCC	2	1	GND

Table 1

LED's

TB-1 has 3 Light Emitting Diodes (LED's) that are connected in a traffic light pattern. Red and green LED's are on each side and the yellow LED is in the middle.

LED's are driven by a 7407 buffer (IC2). Each LED has two pins; cathode (negative terminal) and anode (positive terminal). The current through the LED's are limited through current limiting resistors that tie the anode pins to Vcc. To turn an LED on, the cathode is pulled to ground through the corresponding gate of the 7407 buffer. To turn an LED off, the corresponding gate of the 7407 buffer is deactivated by setting the input of the gate to a logic high level.

Buzzer

Because the buzzer requires higher current than the LED's, buzzer is driven by three 7407 buffer gates that are connected in parallel. Due of the inductive nature of the buzzer, a freewheeling diode (D4) is used to clamp reverse voltages that may be induced on the buzzer when the buzzer is being turned on or off.

Buttons

There are 2 push buttons on the TB-1. Each button is connected through a protection resistor to an interrupt input (P3.2 and P3.3) on the micro-controller. Pressing a button forces a logic low level on the corresponding micro-controller input.

Interrupt Inputs

AT89S53 has port pins (P3.2 and P3.3) that can be used either as general-purpose inputs/output or as interrupt inputs. A high to low logic transition or a low logic level on those inputs can cause a hardware interrupt to be generated.

Timer/Counter Inputs

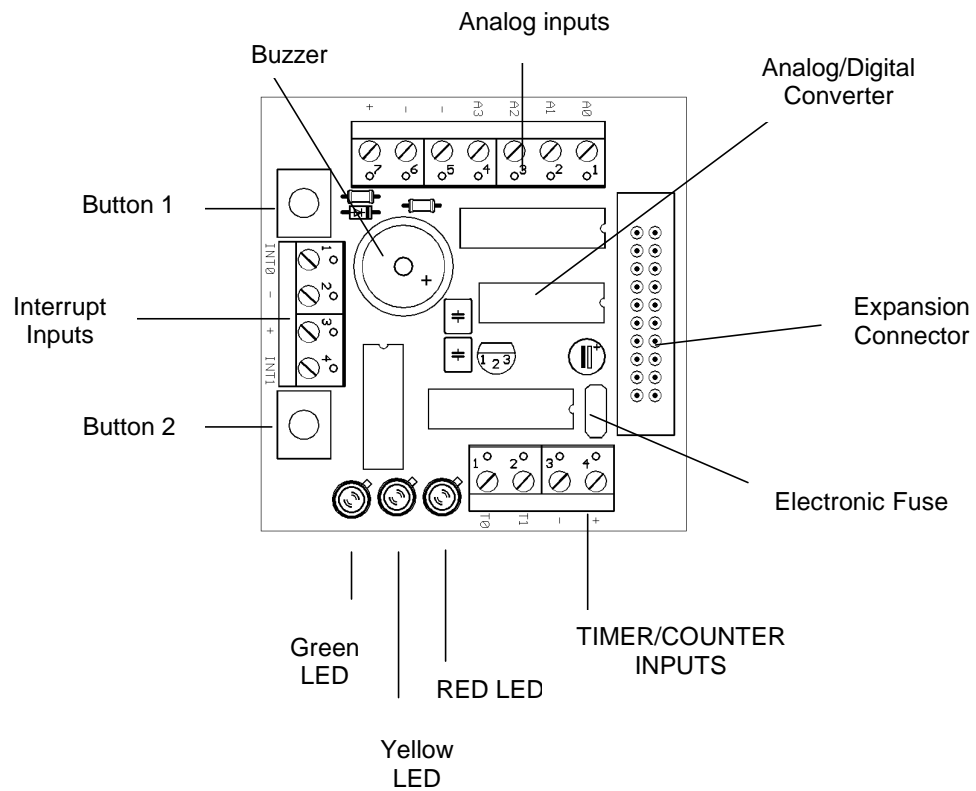
AT89S53 has port pins (P3.4 and P3.5) that can be used either as general-purpose inputs/output or as timer/counter inputs. Logic level changes on these inputs can be counted by the timer hardware on the micro-controller eliminating the need for software polling loops.

Analog-to-Digital Converter (ADC)

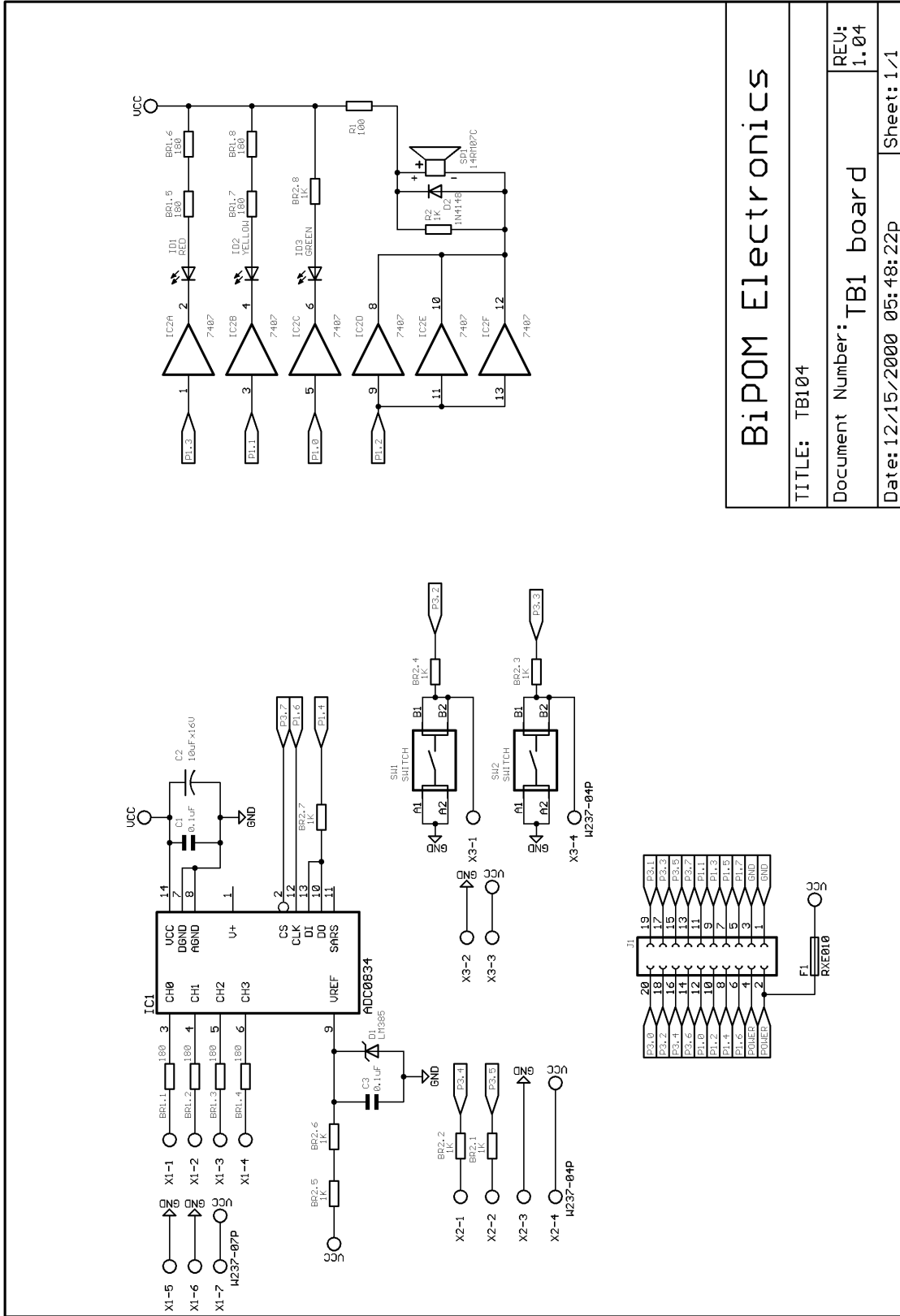
TB-1 has a type ADC0834, 4-channel, 8-bit Analog-to-Digital converter. Analog inputs are available on X1 terminal block. Analog-to-Digital Converter is controlled by the micro-controller through 4 port lines. Chip Select (CS) is an input to the ADC. Chip Select enables data conversion when it is logic low and disables data conversion when it is logic high. Clock is an input to the ADC. Mode of operation (single-ended versus differential) and channel number is entered through the DI pin one bit at a time (on every transition of the Clock input). The 8-bit data that corresponds to the voltage on the selected channel is output on DO one bit at a time (on every transition of the Clock input).

4.Board Layout

Layout of TB-1 board is shown below:



5.Schematic



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