Product Performance Specification

AEC8010 4-Interval Sequence Timer

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Record of Revisions

Rev	Description	Date/By
P1	First development release	12/07/12 RLN
P2	Correction of typos and syntax	12/07/12 RLN
-A-	Release to production. Modified description of RESET command to make it dominant over HOLD command.	1/25/13 RLN
-B-	Change number system used to set timer values from HEX to Decimal. Corrected some typographical errors and brought terms into agreement.	08/25/15 RLN

1.0 Introduction

1.1 This document describes the AEC8010, 4 Interval Sequence Timer (4IST). This device steps through 4 timing intervals (TA, TB, TC and TD) in sequence with durations established by values stored in EEPROM memory to suit end-user requirements.

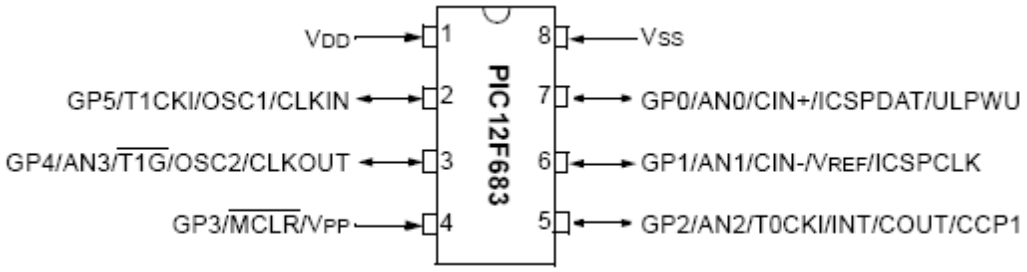
1.2 TA through TD intervals may be any decimal value multiple of approximately 10 milliseconds from 0 to approx 278 hours.

2.0 Acronyms

CRTT	Clock Running Tell-Tale
TA, TB	
TC, TC	Timing interval constants (multiples Of 10 milliseconds) stored in EEPROM
EEPROM	Electrically Erasable Programmable Read/Write Memory
Vdd	5V Supply
Vss	Power Ground

3.0 Characteristics

3.1 Electrical and Physical Characteristics: The core device for the 4IST is an 8-pin, internally clocked microcontroller by MicroChip. For detailed specifications not cited in this document Refer to MicroChip 12F683 micro-controller data.



3.2 Program Presets in EEPROM:

The AEC8010 clock period is fixed at 100 Hz ± 1%. Values for TA through TD are stored in 4-byte, decimal values (DD DD DD DD) which allows programming outputs duration that range from 0.0 seconds to 999,999.99 seconds (~278 hours) for each interval except that interval TA may not be zero.

Values for each interval are manually 'poked' into EEPROM locations as follows (most significant byte first):

Interval Value	EEPROM Location
TA	00 thru 03
TB	04 thru 07
TC	08 thru 0B
TD	0C thru FF

The AEC8010 may be programmed with a code-protect bit set for program memory leaving EEPROM memory accessible for user insertion of TA -> TD values by means of any popular programming tool for the PIC12F683.

3.3 Flag Registers in flash:

This application requires no condition flags be stored in flash.

3.4 Operation and I/O Functions:

3.4.1 The 4IST features 4 discrete outputs written individually HI and in sequence as determined by the timer's present position in the timing program.

3.4.2 Asserting an HI input on HOLD halts the timer in the present condition. A return to LO state allows resumption of the timer count where it left off.

3.4.3 The 4IST features a one-second on, one-second off tell-tale output to show the program is running. This signal is piggybacked onto an active low, warm RESET pin.

3.4.4 A cold RESET is generated by an interruption of Vdd input power.

3.4.5 An EEPROM value of zero for any interval except TA causes that interval to be skipped. When all four interval values have been read and acted upon, the timer loops back to the beginning with interval A.

Table 3-1 AEC8010 4-Interval Sequence Timer Pin-out Chart		
Pin #	Generic Name	Program Name and Function
1	Vdd	5 VDC
2	GP5 i/o output	Output is asserted HI for interval TA
3	GP4 i/o output	Output is asserted HI for interval TB
4	GP3 input with w.pull-up	RUN/HOLD input. Driving this input HI halts incrementing of the timer.
5	GP2 i/o output	Output is asserted HI for interval TC
6	GP1 i/o output	Output is asserted HI for interval TD
7	GP0 i/o w.pull-up	A timer RESET input piggybacked with a clock running tell-tale. This output toggles one second high as input with pull-up and one-second low as an output to illuminate an LED. A RESET command is asserted by holding this input LO during LED off time. RESET is dominant over HOLD.
8	Vss	Ground

4.0 Ordering Information

4.1 The full part number for the AEC8010 adds digits to the base part number to specify values for TA through TD.

- Example 1: A timer with three outputs of 3 seconds, 2.4 hours, 0.1 seconds would be described by the part number AEC8010/3.0S/2.4H/100Ms/0 and read as “3.0 seconds, 2.4 hours, 100 milliseconds and Zero”

- Example 2: A two output flip-flop flasher with 1 second ON times interleaved with 1/3 second OFF times would be part number AEC8010/1S/330mS/1S/330mS

- Example 3: A three output, one-time-through timer with 190 milliseconds, 1.3 hours, 20 seconds followed by an indefinite HOLD would be part number AEC8010/190mS/1.3H/20S/1S. In service the output D would be tied to the RUN/HOLD pin such that assertion of the 4th interval output would place the chip in a perpetual hold condition pending a hard or soft RESET.

5.0 Applications

5.1 Applications for this device include:

5.1.1 Compressor energy management for shop air. For example: Interval 1 might be programmed for 2 hours duration. Output A would be used to energize a solid state relay in series with the compressor's AC power. The second interval might be 15 seconds where output B is used to open a water drain valve on the air storage tank. The third interval might also be 15 seconds output on C and used to close the water drain valve. The fourth interval might be some value like 100 hours.

When shop air is needed, hitting the reset switch will make power available to the compressor for 2 hours. At the end of that interval, a 30 second drain cycle is initiated and the power shut down. It can be restored anytime by hitting the reset button. If left unattended, the time will cycle the compressor on for 2 hours approximately every 4 days.

5.1.2 On-limit timer for dome and under-wing lights. An airplane being unloaded in the dark could be fitted with utility lighting powered by ship's battery but with an on-limit timer that would allow the airplane to be secured with the lights on and shut off automatically after some practical time limit.

5.1.3 Three-output flasher for 'rat race' decoration around signs.

5.1.4 Time delay generator

5.1.5 Automatic door closer for garage door left in an unattended open state.

5.1.6 Auto shut down for soldering iron on bench (prolongs tip life).

5.1.7 Auto shut down for lights in a shop. Output A keeps the lights ON for interval TA. Output B might energize a 'night light' facilitating a trip to the button that brings the lights back on. Output C would loop to RUN/HOLD to keep the cycle from repeating by itself.

5.1.8 On limit timer for vehicle head lights (were that feature is not already installed).