

3 Circuit Operation

Refer to Figure 3.1 and the circuit diagram included in Chapter 7 of this manual.

3.1 General

The internal circuitry of the MDT can be sub-divided into eight functional blocks, namely:

- protection
- power supplies
- LCD backlighting
- piezo and driver
- serial interface
- keypad
- LCD module
- microprocessor and memory circuits.

The salient features of each functional block are summarized in the sub-sections that follow.

3.1.1 Protection Circuitry

The protection circuitry comprises:

- Two PCB track fuses for overcurrent protection of the Main PCB. They are intended as board level protection from major faults. The track fuses are accessible from the bottom side of the PCB.
- A 5 W Zener diode (D5) type 1.5KE18A which breaks down nominally at 18 V (17.1 V minimum). This diode provides combined overvoltage and reverse battery protection. D5 will clamp short transients but is destroyed (fails short circuit) by continuous overvoltage or reverse battery condition, which may cause the PCB track fuses to blow. Under such circumstances the diode must be exchanged for a new one, and the PCB track fuses must be repaired.

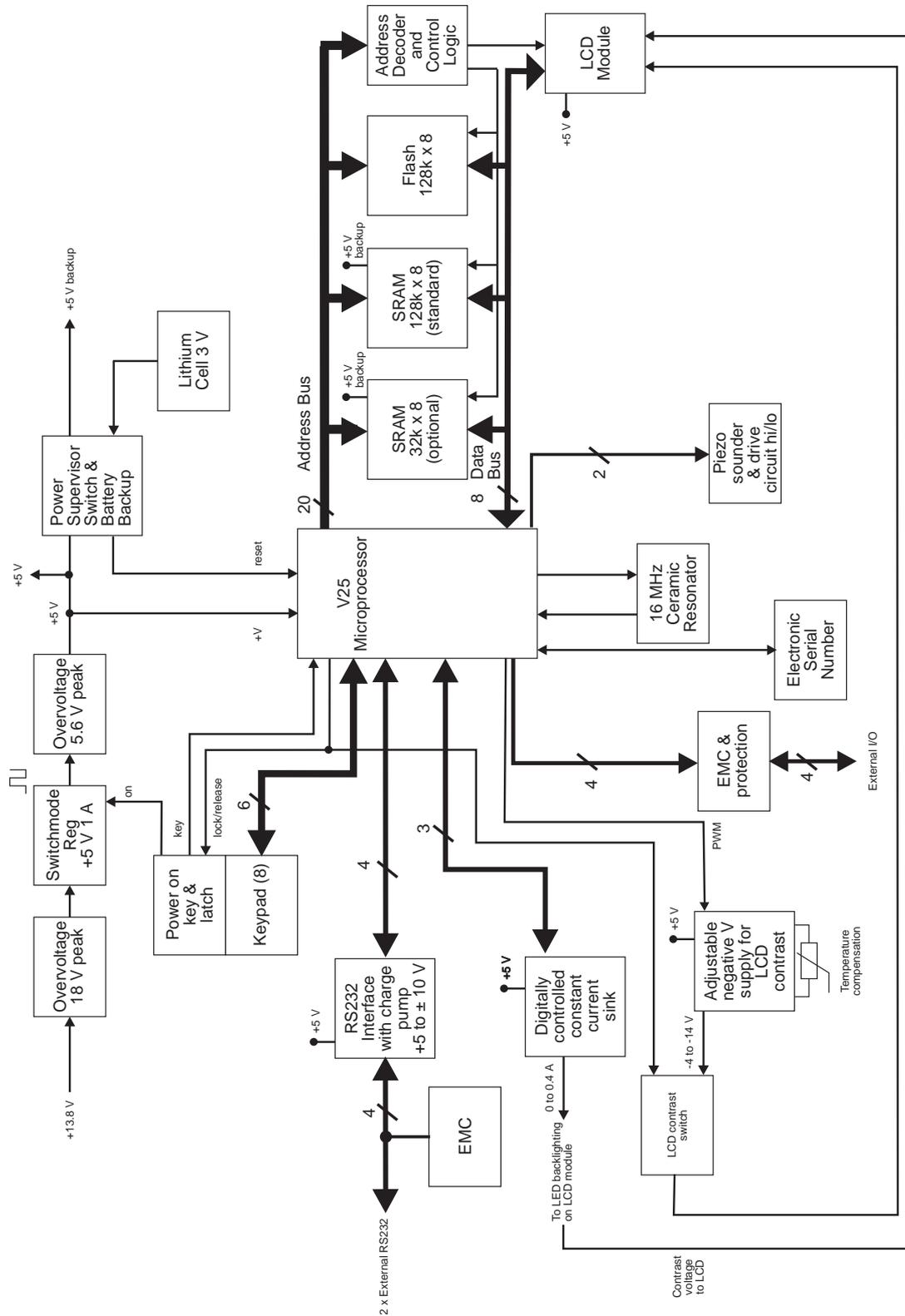


Figure 3.1 T610-100 Block Diagram

- A Zener diode, type IN5908, (D1) which breaks down at 6 V minimum. This diode provides a secondary overvoltage clamp for the regulated power supply output. D1 is unlikely to be activated under normal circumstances.
- Four BAV99 diodes (D7 to D10) that provide voltage clamps to the external I/O lines to prevent microprocessor latch up. RC filtering is provided to maintain EMC.

3.1.2 Power Supplies

The power supply circuitry consists of:

- A stepdown switching voltage regulator, primarily comprising components IC10, D2, L3, C167, C168 and C169, supplies +5 V. The regulator IC10 is enabled (via Q6) by a momentary press of the on/off key on the front panel of the MDT. The microprocessor, when running, latches the regulator on (Q7).
- A 3 V, 500 mAh lithium cell and power supervisor chip (IC6) provide battery backup switching to SRAM (IC5 or IC3 depending on which size is fitted).
- An inverting switching regulator, primarily comprising components IC12, D6, L1 and C132, supplies the LCD module with contrast voltage; -7.8 V typically, adjustable from -4 V to -14 V. The contrast is controlled by PWM signals from the microprocessor and has simple temperature compensation by thermistors R81 and R82. The LCD contrast voltage is switched to the LCD module during power up and power down by Q11, Q12 and Q13.

3.1.3 LCD Backlighting

The LCD module is backlit by an integral LED array. The brightness of the LED array is controlled by circuitry that provides a digitally-controlled constant current sink. This circuitry is formed around Q1 and IC8, and provides 400 mA of LED current at maximum brightness.

3.1.4 Piezo and Driver

A piezo electric transducer (PZ1) is fitted to provide audible alerts. This is driven from the microprocessor via level shifters Q9 and Q10. The circuit can be driven by one or two ports to provide high/low volume level.

3.1.5 Serial Interface

The microprocessor (IC13) provides four serial port lines (two ports with independent Tx and Rx lines) for serial communications. IC13 provides RS232/TTL level conversion from the +5 V supply for these four port lines.

RC filtering is provided to maintain EMC.

3.1.6 Keypad

The front panel Elastomeric keypad has eight keys that are arranged in a two-row by four-column matrix for the microprocessor. The on/off key is connected to separate power circuitry, but has a level shifter (Q8) that signals a keypress to the microprocessor.

The keypad assembly is constructed using a flexible PCB.

3.1.7 LCD Module

The LCD module is a 240 x 64 pixel STN display with LED backlighting. The module has a built-in LCD controller and LCD driver. This is attached to the main microprocessor data and control bus.

3.1.8 Microprocessor and Memory Circuits

The salient details of the microprocessor and memory circuitry are as follows:

- IC1 is a μ PD70320 (V25) microprocessor. This is connected to 128 k x 8 bit, +5 V flash memory and 128 k x 8 bit SRAM (32 k x 8 bit SRAM is optional).
- The V25 clock runs at 16 MHz, which is formed around a ceramic resonator.
- Logic gates IC7 and IC9 provide address decode and control for memory and the LCD.
- An electronic serial number (DS2401), SN1, is fitted for security purposes. The serial number is unique to each individual unit. The microprocessor communicates serially with the electronic serial number via a dedicated port pin.

END OF CHAPTER 3