The LM75 chip also includes a *thermal watchdog* that can be set up to interrupt the PIC on its RB0/INT edge-triggered interrupt input when the temperature rises past a programmable setpoint, T_{OS} (where OS stands for overtemperature-shutdown). It includes programmable hysteresis so that the temperature must dip down below the setpoint's T_{OS} threshold to a lower T_{HYST} threshold before rising again past the T_{OS} setpoint to generate another output edge.

The chip includes a power-on reset circuit that defaults to the operation shown in Figure 9-12b. At power-on time the PIC may come out of reset first; therefore, it is necessary to insert a delay before initializing the LM75's thermal watchdog circuitry. Otherwise the PIC's commands to the LM75 may go unnoticed.

The register structure of the LM75 is shown in Figure 9-13. When a "write" message string is transmitted to the chip, the first byte selects the chip for a write and the second byte loads the Pointer register. The write message string can stop there (illustrated in Figure 9-14a), or it can continue with a 2-byte write of 100°F = 75.5°C to the T_{OS} register (illustrated in Figure 9-14b). Once the pointer has been set, any of these registers can be read, reading 2 bytes for temperature, T_{OS}, or T_{HYST} (illustrated in Figure 9-14c) or reading just 1 byte for the Configuration register.

If the thermal watchdog function of the LM75 is not used, then advantage can be taken of the power-on default clearing of the Pointer and Configuration registers. In this case the interactions with the chip need be no more than successive reads of the temperature, as illustrated in Figure 9-14c.

9.6 SERIAL EEPROM

EEPROM (electrically erasable, programmable read-only memory) technology supplies *nonvolatile* storage of variables to a PIC-controlled device or instrument. That is, variables stored in an EEPROM will remain there even after power has been turned off and then on again. Some instruments use an EEPROM to store calibration data during manufacture. In this way, each instrument is actually custom built, with customization that can be easily automated. Other instruments use an EEPROM to allow a user to store several sets of setup information. For an instrument requiring a complicated setup procedure, this permits a user to retrieve the setup required for any one of several very different measurements. Still other devices use an EEPROM in a way that is transparent to a user, providing backup of setup parameters and thereby bridging over power outages.

Temperature	Digital Output	
	Binary	Decimal
+125°C	0 1111 1010	250
+25°C	0 0011 0010	50
+0.5°C	0 0000 0001	1
0°C	0 0000 0000	0
−0.5°C	1 1111 1111	512 − 1 = 511
−25°C	1 1100 1110	512 − 50 = 462
−55°C	1 1001 0010	512 − 110 = 402

Figure 9-11 LM75 output coding of temperature.

An EEPROM with designers with a conven It is packaged in a tiny will operate on the "fast programming, 1 mA du matically erases a byte t time and the chip will p The manufacturer guara tion beyond 200 years o the industrial version).

The device with its mits a manufacturer to p reads thereafter (with W part has the single, fixec

1010

That is, any read from o will access the EEPROM

Figure 9-12 LM