New life for an old VZ

Graeme Meager

Since the introduction of the VZ200 computer in early 1983 many users have been mystified by the fact that the computer did not support full level II BASIC. This article describes a method of gaining 24 extra level II BASIC commands for the VZ 200 or 300 without sacrificing any memory or software compatibility.

RECENTLY a team of enthusiasts released a revamped 16K ROM (read only memory) for the VZ with the convenience of LEVEL II BASIC on power-up and with some technical knowledge, every user can smarten up their computer.

As many users may remember, the existing ROMs were a major cause of breakdowns and possibly there are still many old VZs put away in cupboards which can be brought back to life with these new ROMs. This particular occurence prompted one user to investigate the viability of producing an EPROM to replace the original BASIC ROM. When it was discovered an EPROM was available that was pin compatible with the old 16K ROM, the task for VZ300 owners was made very simple. VZ200 owners should not dispair, with the addition of just two diodes and one resistor both 8K ROMs can be replaced by this single 16K chip.

Before entering into details of the hardware modifications, I will briefly describe the extra facilities the new ROM will provide and how they have been implemented.

THE ADDITIONAL BASIC COMMANDS:

TRON	TROFF	DELETE	AUTO
FIX	CINT	ERROR X	ERR
POS	ON	DEFINT	DEFSNG
RANDOM	MEM	ON ERROR	VARPTR
DEFDBL	RESUME	FRE	CDBL
ERL	STRING$	DEFSTR	ON (GOTO)

Inverse characters

Owners of GP 100 and compatible printers will be familiar with the badly represented inverse character set; these errors have been corrected in the new ROM. For the owners of EPSON and compatible printers, a version of the EPROM with the modified control codes and inverse character tables is currently being compiled.

The above BASIC commands have been integrated with the original command set, which as a major consideration, enables all existing software to run unimpeded in the new system. The new ROM provides all commands without those messy loader routines, machine code calls and it is DOS (disk operating system) compatible.

The software

Statement and command execution in the VZ is by interpretation. This means that a routine dedicated to the statement type or command is called to interpret each line and perform the necessary operations. This is a common method of system command execution and is used by many other BASIC systems. Within the BASIC ROM there is a table known as the RESERVE WORD LIST. This table contains all of the words reserved for use by the BASIC interpreter.

When a line is read by the interpreter it scans this list and if the word (command) is present it will allocate a TOKEN value in the range 80 (HEX) to FB (HEX). This token will be written into memory as the BASIC command. From here on the interpreter will act on these tokens and not the original word. Each of the new commands have their own token with the allocated range and will be acted on in the same way the existing commands are. At this stage it should be noted that the original LEVEL II BASIC did not support routines for commands such as COPY, COLOR, MODE, SOUND, CRUN, CLOAD and VERIFY. These commands have used tokens originally set for other LEVEL II reserved words. The new VZ ROM actually supports more BASIC commands than the original LEVEL II ROM in the TRS-80 and SYSTEM 80 (for non-disk systems).

Once a value has been allocated, execution is passed to the VERB ADDRESS TABLES. Here the table is used to direct the interpreter to the routines specified by each TOKEN. There are two VERB ADDRESS TABLES: the first is used for statements that begin with a — VERB — for example END, RANDOM or PRINT. If the statement does not begin with a token, control goes to the assignment statement processing. The second table contains the addresses of verb routines which only occur on the right side of an equals sign or compliment the first verb — for example PEEK, FRE, SGN.

The new commands have been implimented by writing new values into the above tables, so the interpreter can be driected to the relevent processing routines.

As mentioned earlier, a number of areas in the ROM had to be re-organised. For example, the token 9E in the VZ ROM is allocated to the word SOUND and not the word ERROR, as originally written. Routines within the ROM had to be corrected so that when the interpreter was confronted with a format such as "ON ERROR GOSUB . . . " it would recognise the line as correct syntax.

Other commands and routines are under investigation, and as they are proven compatible I understand they will be released as an update to enhance the new ROM on a change-over basis at a minimal price to purchasers. Each of the EPROMS released carry a programmed serial number to identify their generation and is apparent in the start-up header which reads as follows:
LASERLINK BASIC
VER. 2 #2130
READY

VZ200 MODIFIED CIRCUIT
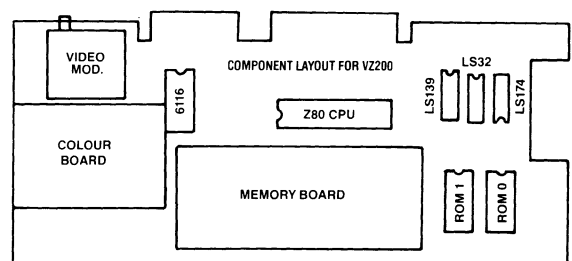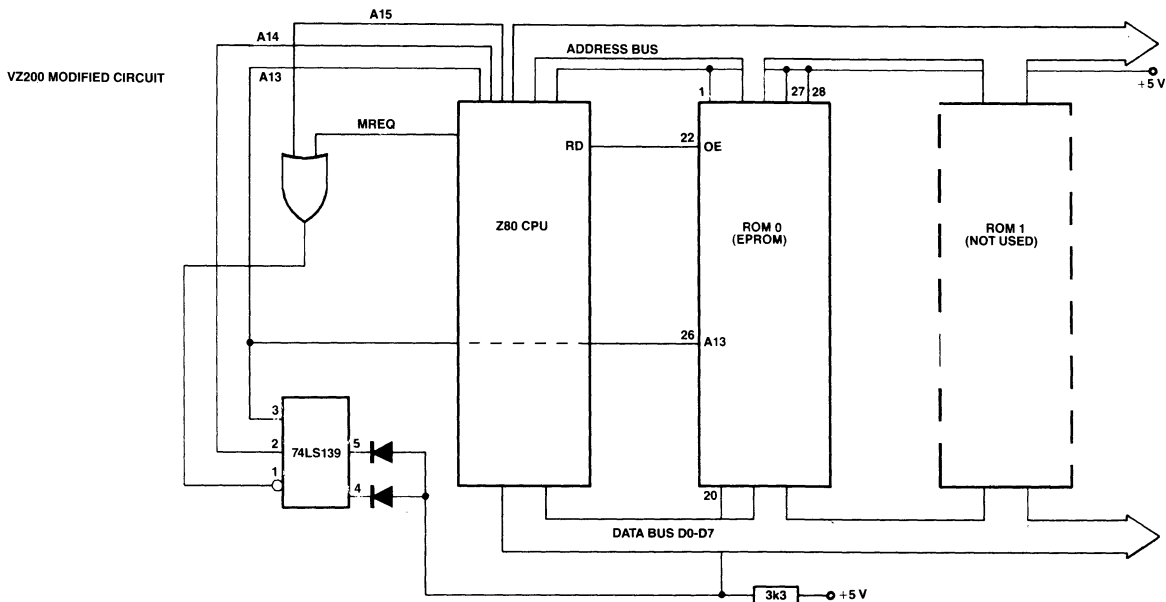
The hardware

Firstly, readers should be aware of the following points:

(a) any hardware modifications will void any warranty if current,

(b) this project should only be attempted by someone with reasonable soldering and desolder skills,

(c) to date, the modification has been carried out on VZ200s, both early and recent VZ300s (brown keyboard) and the LASER 200/310.

A check of compatibility with the following details should be made before commencement.

The case of the computer can be separated by removing the six screws from the bottom half. Care should be taken not to snap any of the keyboard cables. The main circuit board must then be separated by removing the screws holding it to the base. The wires to the piezo transducer will not have to be disconnected if they are long enough to rotate the board to gain access to the solder side.

The next step is to remove the RF shield by desoldering the lugs and braids attaching it to the board. For the VZ300, the diagram here should help locate the 28-pin ROM. The old ROM should be carefully desoldered and removed to be replaced by a DIL socket that is provide with the new EPROM. The unit can then be assembled and tested.

For the VZ200, two 8K ROMs can be replaced with a single 16K ROM by adding the necessary addressing circuitry and one extra memory address line. From the extract of the VZ200 circuit shown here, the 74LS139 decoder allows addressing of 000-1FFF(HEX), the first 8K ROM and 2000-3FFF(HEX) for the second 8K. These outputs need to be combined by diodes to access the full 16K. A resistor is needed to pull the chip select pin (active low) high during non-access periods. To read the full 16K, address line 13 is needed. The second diagram will help locate the two 24-pin ROMs which can be removed in the same manner. As it will be noticed, the board caters for a 28-pin socket so no extra holes are needed.

The 28-pin socket should be inserted in the position nearest the regulator heatsink. Pin 26 of the socket should be disconnected from the + 5 V common with a sharp knife to cut the printed circuit track. Pin 27 should then be connected to pin 28 (+ 5 V). A piece of hookup wire will be needed to connect pin 26 (A13) to pin 3 of the Z80 CPU. As shown in the diagram the two diodes and the 3k3 pullup resistor can be soldered on the bottom of the board using spaghetti to insulate them from other components. The diodes are connected between pins 4 and 5 of the 74LS139 and pin 20 of the EPROM, which is in turn tied high by the 3k3 resistor.

Check carefully for any solder bridges on both sides of the board, and when you are certain everything is correct, you can re-assemble and test.

At $35 (postage paid) the new EPROM is available from
LASERLINK
20 Brunker Rd
Broadmeadow 2292 NSW
(049) 62 1678

The EPROM comes complete with socket and full documentation which includes demonstration listings for each of the 24 new commands. A list of state agents can be obtained from the above address. All in all, you'll find it a worthwhile enhancement. ♣

COMPONENT LAYOUT FOR VZ300

VZ200 CIRCUIT MODIFICATION