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ELF II CASSETTE I/O

For most Elfers, storage and retrieval of programs on cassette tape is almost indispensable. Problems here can be frustrating, particularly if one is unsure of what signals he should be getting. Here based on my own experience are some general suggestions and some specifics on the Netronics Elf II signals.

Poor quality tapes or tape recorders are often suggested as culprits. I use a \$15 "no-name" recorder and the cheapest tape I can find. I have never had any trouble. These seem unlikely to be the reason retrieval fails completely, although cheap tape can cause dirty tape heads and accelerate headwear. If your playback volume is low, try cleaning the tape head with alcohol; even wiping with a handkerchief may help some.

Function slide switches can get dirty and produce low volume and erratic playback. If your tape header tone does not sound loud and clear on playback, dig into the recorder and spray volume control cleaner (e.g. No-Noise) on the switch while working it several times. This can produce miraculous cures.

If the phase of the playback is not the same as the phase on recording, you must invert one of these. (See p.7 of October 1978 issue.) This is done with jumpers on the Netronics Elf. A Netronics bit is recorded as a high half cycle followed by a low half cycle. If this is played back into the Elf as low-high, the Netronics monitor is unable to make sense of it and refuses to load.

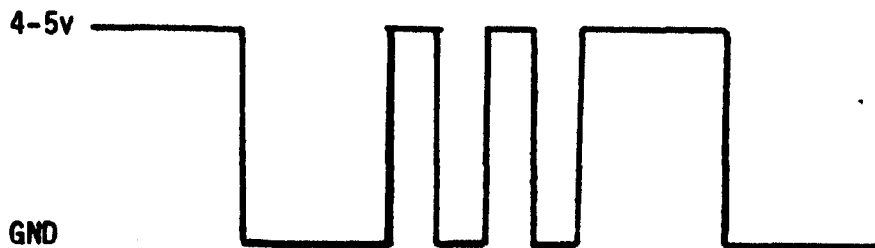
The Elf II output to the recorder can be checked with a voltmeter. Before the header tone begins, the "hot" output-to-cassette line is 0.6-0.7 volts positive with respect to ground (use a DC scale). The tone signal is an RC-rounded square wave, rising and falling between about 0.6 and 1.0 volts. During the header (and it changes only insignificantly during the program bytes) a full-wave voltmeter will read 0.2 to 0.3 volts on AC. (A half-wave voltmeter will read about 0.9 volts on AC since it also registers the 0.6 volt no-signal voltage.) With the Q line swinging the full 5 volts, one might be expecting larger output signals to the recorder, but this apparently is unnecessary. My recorder sets the record level automatically; if yours does not, experiment.

On playback, the Elf can successfully read signals that show up as about 1 volt on an AC voltmeter. My highest playback volume setting gives 4 volts AC, which works fine also. If one is unable to muster recorder AC outputs in this range, even with clean heads and the function switch cleaned and lubricated as mentioned above, he will have to add an amplifier stage somewhere or use another recorder, or maybe higher-output tape. An oscilloscope shows severe clipping on my highest volume setting but this seems to make no difference to the Elf II.

By studying the Netronics monitor program or by putting an oscilloscope on an Elf II, some bit/byte details can be seen. One cycle of 2400 HZ (0.43 m sec p-p) represents a "1" bit. One cycle of 800 HZ (1.25 m sec p-p) is a "0" bit. The pre-program header tone is a continuous train of "1" bits. Each of the 8-bit program bytes is laid down on tape actually as 10 bits: one "0" start bit, the 8-bit byte, and a parity bit. The most-significant bit of the byte immediately follows the start bit, and the least-significant bit immediately precedes the parity bit. The parity bit is "1" if there are an even number of "1" bits in the byte, "0" if odd. For example, the two bytes 3B 3A will be recorded as twenty bits as follows:

parity
 ┌──────────┐
 00011101100001110101.
 start bits ┆ 3 ┆ B ┆ 3 ┆ A ┆

The parity bit is an excellent feature. If the number of "1" bits read by the Elf II as a byte does not agree with the parity bit, the Elf II quits trying to load at all. As a result, program retrieval from cassette tends to be all or nothing, frustrating or rather certain. Perhaps some of this information will help get your Elf Cassette I/O in the latter category.



"0110" on Q line during record.



Output of LM3900 op-amp during record. Goes to tape recorder.



Output of tape recorder on playback. Elf squares it back up to original shape with a LM3900 & sends it to EF2.