***You could build this computer in just a few nights!***

# DREAM 6800

## *Second article on this innovative design*

**This month, author Michael Bauer gives the construction, testing and trouble-shooting procedures for the DREAM 6800. If you get started on yours now, youcould have it ready to run the programs we will be featuring next month. Included inthis article is the full hex listing of the DREAM's high-level interpreter/monitor program, CHIPOS.**

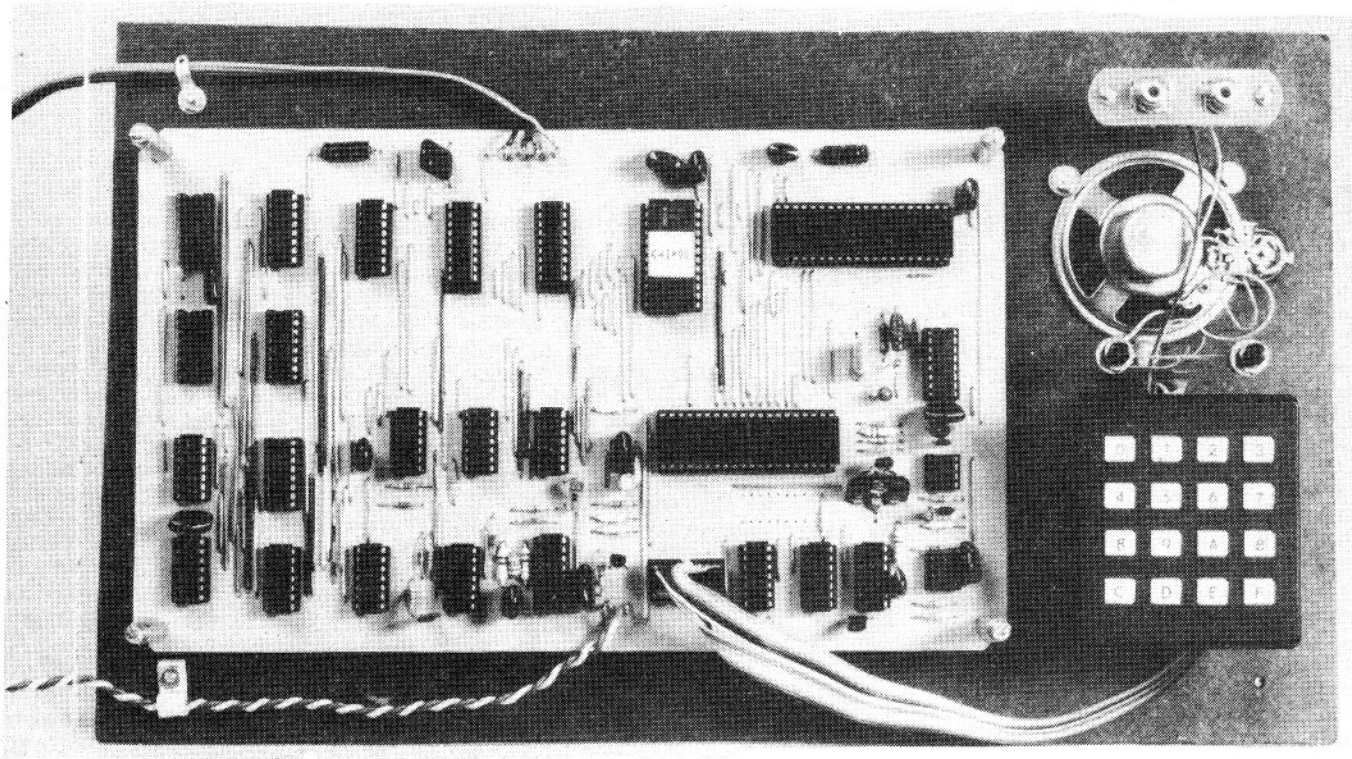
Before soldering, inspect the PCB for flaws. Make sure the PCB is clean. If it is not tin-plated, scrub the copper pattern of the PCB thoroughly with soapy water and steel wool. Solder does not take very well to tarnished or lacquered copper.

You will need a low wattage (20 to 40W) or temperature controlled soldering iron with a fine tip. Some tracks on the PCB come very close together, which means great care is needed to avoid solder bridging. Use 22 gauge, 60/40 resin-cored solder. Do not attempt the job with an old carbon-element iron like a "Mini-Scope" or "Birko". It's about time you bought a precision soldering instrument, anyway.

(Editor's note: The author's recommendation against carbon-element irons refers to the possibility of damage from these irons to some ICs particularly CMOS types. This is because the heavy current flowing in the soldering iron tip prevents it from being effectively earthed. This allows the possibility of damaging voltages being applied to an IC while it is being soldered.)

Bend the leads of components (and links) with pliers before insertion into the board to avoid stressing the casings. Splay the leads outward on the solder side of the board to hold the part in place during soldering. IC's can be held with masking tape, or a finger if you've got three hands. Note that all resistors (except one) have standard half-inch lead spacing. Use the minimum amount of solder practicable for each joint; don't make blobs!

*Our prototype was built on a hardboard base with a perspex cover to protect and show off the PC board.*



Begin construction with the links, which are considerable in number but think of the $10 or more saved over the price of a double-sided plated-through PCB. Links may be made from tinned copper wire, except for long ones (where there is danger of shorting) which should be insulated. Next, solder in the IC sockets, the keypad I/O socket, and if desired, the expansion sockets. It is recommended to only use sockets for IC's 1,2,3,4,7 and 9. If any others prove faulty, they can be removed with the aid of solder-wick or a solder-vac. The passive components (R,C & L) can then be mounted, followed by the ICs, diodes, pot, transistors, crystal and terminal pins for power and video. Observe orientation of ICs, diodes, tantalum capacitors and transistors. Do not yet plug in ICs 1,2,3 ,4,7 and 9.

Before powering up, inspect your workmanship closely for solder bridges, missing links or components and disoriented parts. By the way, resin residue may be removed from the PCB with a toothbrush dipped in acetone or methylated spirit.

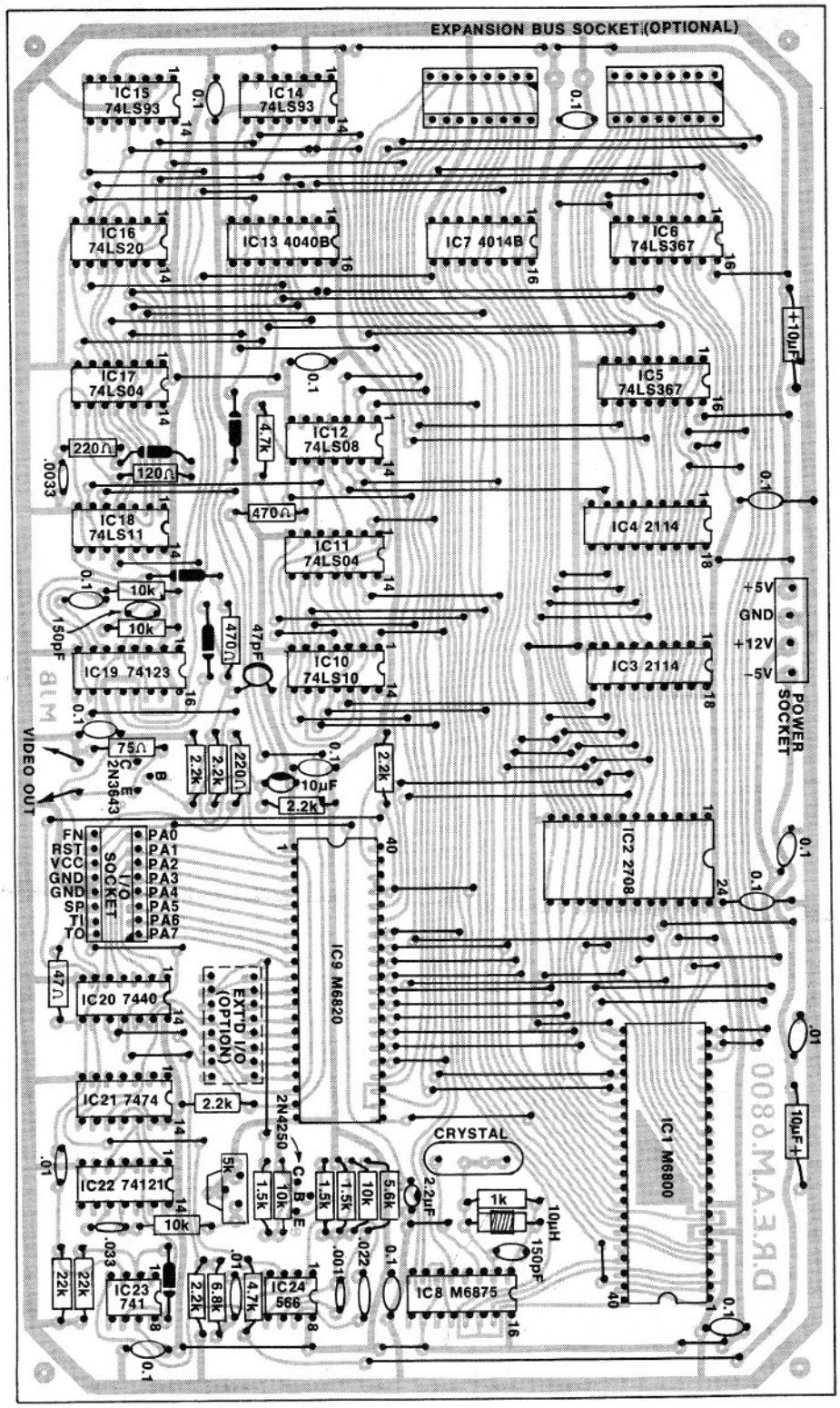
First connect the power supply. Details of a suitable power supply are given elsewhere. You should check the output voltages and regulation under load before applying power to the computer. A 47 ohm, 5 watt resistor will do for a load.

Next, a video monitor needs to be installed. If you can convert your TV to accept a video signal, the results will be worth the effort. Otherwise an RF modulator may be employed to feed the signal into the antenna input. This is the easiest way to get video, and you have the advantage of being able to use your computer on any TV set, anywhere.

Several possibilities exist for choice of keypad. The most economical is to wreck an old calculator. Some obsolete desk-top models used magnetic reed switches which are ideal. The complete computer might be able to be housed in the cabinet of such a calculator. Alternatively, a variety of keyboards, current models and obsolete industry surplus models are available, mainly through the international mail-order houses, at prices from 99 cents to over $10. Whatever you decide on, make sure it is (or can be) wired in a 4 x 4 matrix as shown in the wiring diagram.

Also, it will be an advantage if there is room on or around the keys for labelling (e.g. for special functions, or alphabetic symbols). A further two keyswitches are needed for [FN] and [RST]. As these will be used frequently, they should be of high quality, not cheap and nasty pushbuttons.

Wire the keypad (incl. FN and RST) to a 16-pin DIL plug via a short length (up to 0.5m) of 12-conductor ribbon cable. The GND lines (2) should separate the PA lines from CA2 and RST. Connect a small 8-ohm speaker and diode to pins 11 and 14. The system is now ready for the smoke test.




*Install the wire links before mounting any other components on the PCB.*

With ICs 1, 2, 3, 4, 7 and 9 removed, power and TV connected, switch on and immediately check voltages at the power socket. If there are no loud noises nor signs of molten silicon, adjust your TV (and RF modulator) to get a large white rectangle centred on the screen. If it is not forthcoming, chances are that there's something wrong with your RF modulator, or a certain 2N3643 is in backwards. Having eliminated these as the source of error, but still getting no picture, go to the section on trouble-shooting.

One you've got a picture (large white rectangle), remove power and proceed to plug in ICs 1,2, 3, 4, 7 and 9, and the keypad and speaker. It is very important when handling MOS devices that everything is at the same potential and preferably earthed, in particular your

printed board (GND line), your work surface, and yourself. Don't wear nylon pantyhose or rub ebonite rods in your hair while handling MOS!

Apply power once again, and you should notice a short bleep in the speaker and something resembling fig. 2 on the screen. The actual pattern and 4-digit number seen are just random garbage in the RAM at switch-on. Try keying in any 4 hex digits. This number should then appear on the screen, and if so, your computer is, in all probability, fully operational. See how many 4-letter words you can make from the hex digits: A,B,C,D,E and F. If your system fails to display the above information (after resetting), see how many 4-letter words you can mutter to yourself and then proceed calmly to the section on trouble-shooting.

Once the video generator and processor appear to be working, you can try using the memory-modify command. Hit [RST], then enter 0, 1, 0, 0, the starting address of the display refresh buffer. Now key [FN] followed by [0] to get into "memod". The display window will show a 2-digit number beside the address. This is the contents of location 0100, which can also be seen in binary at the upper LHS of the screen. (A white dot = 1, no dot = 0.) Step through the memory by pressing [FN] repeatedly. Go back to 0100 (hit [RST], 0, 1, 0, 0, [FN], 0). This time, write into the buffer by keying in a pair of hex digits, and another, and another . . . noting the binary pattern formed by each byte.

Notice that as data bytes are deposited into memory, the address flips to the next address, before you see the byte just keyed in. This is a design compromise (not an oversight), but should be of no concern because you're not likely to be looking at the screen anyway, when keying in a program. One eye will be on a listing, the other on the keypad. The data, having been entered, can be verified later by stepping through with the [FN] key.

Getting the feel for it, and want to try a CHIP-8 program? Try the simplest possible! Use memod to enter this data at 0200:

| Address | Data | Mnemonic |
|---|---|---|
| 0200 | F0 | go to monitor |
| 0201 | 00 | |

The instruction F000 does not exist, and will result in a jump back to the monitor (CHIPOS), but first the interpreter clears the screen, as it does at the start of each new program, (unless you start from C002). To run this "program", hit RST, C000, FN, 3 (GO from C000).

Here's something to watch CHIPOS's random number generator at work:

| | | |
|---|---|---|
| 0200 | CA3F | VA is random x-coord (00-63) |
| 0202 | CB1F | VB is random y-coord (00-31) |
| 0204 | A20A | Point to pattern byte (I=20A) |
| 0206 | DAB1 | Display 1 byte at coords (VA, VB) |
| 0208 | 1200 | Go to loc'n 0200 for next instr'n |
| 020A | 8000 | DATA: 80hex = 10000000 binary = dot. |

Before the programs get too much bigger, you'll want to save them on cassette. If your recorder has line (auxiliary) input and output, you're fortunate because these voltage levels are optimum for use with the DREAM-6800's tape modem. Also it is highly desirable (but not essential) that the recorder's internal speaker not be muted, so that the leader tone can be located by sound. Hence, recorders with only an EXT-SPKR (or earphone) jack should be modified such that insertion of the plug does not result in disconnection of the speaker. If this is awkward, another speaker can always be connected externally.

Do not operate the recorder at high volume when connected to the computer. Voltage levels exceeding 5V peak-peak could damage IC23, but this is improbable at normal listening levels. Further, recorders without an AUX input may require a much lower signal level from the computer, for use with the "MIC" input. This problem is easily solved by inserting a 220k resistor in series with the "TAPE-OUT" line (pin-16). Shielded cable should be used for the tape connections, with the shield wired to pin-13 of the I/O plug.

To test the cassette functions, proceed as follows. Use the "memod" function to create a pattern on the screen, as described earlier. Then define the beginning and ending addresses of the block you want to save, in this case the display buffer page from 0100 to 01FF. For convenience, the ending location PLUS ONE is specified. Hence to dump the display, deposit the following data at 0002:

| | | |
|---|---|---|
| 0002 | 01 | Beginning address MSB |
| 0003 | 00 | Beginning address LSB |
| 0004 | 02 | Ending address (+1) MSB |
| 0005 | 00 | Ending address LSB |

# HOW WE BUILT OURS:

Since the author did not present a proto-type with his article, we decided to build our own, both to confirm the design and to aid presentation of this attractive system in the magazine. With the latter idea paramount, we decided to mount the PCB on a hardboard base with a perspex cover to protect and show off the unit.

The perspex cover is also used to mount the keyboard, two pushbuttons and the tape interface sockets. This method of construction is easy to build, is very economical and produces an attractive unit.

Readers will note that we have used IC sockets for the ICs on the PCB. We did this as a precaution — if bugs had shown up, we wanted to be able to change ICs with a minimum of work. Nevertheless we are inclined to agree with the author's comments on IC sockets.

The miniature speaker is mounted face down on the hardboard base. Even so we found the loud bleeps it emitted quite annoying, so we muted it with a preset pot, as suggested by the author.

Rather than salvage a keyboard from a calculator or other source, we took the easy but expensive approach of buying a new one. We used a Digitran KL0043 keyboard, which has the buttons connected in a 4 x 4 matrix as required but with a slightly different numbering to that shown on the circuit published last month. However, this presents no problem.

The keyboard can be purchased from Radio Despatch Service, 869 George Street, Sydney, NSW 2000. Radio Despatch Service have notified us that since the wholesale price of the keyboard is high, they have reduced their own margin to a minimum. Even so, the KL0043 will set you back by $20.43, including sales tax. Radio Despatch Service also have a ready source of suitable perspex in the form of surplus smoke-tinted record deck covers, at $2 each.

For the RST and FN pushbuttons we used two good quality momentary contact switches. We didn't bother to label these as they are used so often that it soon becomes second-nature. The FN button is mounted on the right and the RST on the left, immediately above the keyboard.

The major ICs for our unit, with the exception of the CHIPOS EPROM, were supplied by Total Electronics, 155 Willoughby Road, Crows Nest, NSW 2065. Silicon Valley Stores and Applied Technology Pty Ltd, 1a Pattison Avenue, Waitara, NSW 2077 will be able to supply all the IC's, including the CHIPOS (2708) EPROM.

Two other firms have EPROM programming services: A.J.F. Systems & Components Pty Ltd, 29 Devlin Sreet, Ryde, NSW 2112 and Warburton Franki (Sydney) Pty Ltd, 199 Parramatta Road, Auburn, NSW 2144.

## DREAM 6800

[N.B.: 01FF+1=0200; MSB = Most significant (high-order) byte; LSB = Least significant (low-order) byte.]

Thus, a 256-byte block is defined, from 0100 to 0200, not including the last byte (at 0200). The same block applies to a load or dump. This simple tape format lets you load a file (or part thereof) into any place in RAM, regardless of where it was dumped from, thereby allowing relocation of data or programs.

Having got that, reset the system, start the cassette in RECORD mode and adjust the recording level, and let it run for several seconds to write a "leader" tone (steady 2400 Hz). Then key [FN][2] (dump/save). The screen will be disabled until the dump is complete, because the serial I/O software cannot tolerate the display refresh delays.

To verify the dump, and to test your demodulator, power down the system to destroy RAM contents. Once again, enter the begin and end locations, as above. Set the DEMOD trimpot to mid-position. Rewind and play the tape until the leader tone is heard, then press [FN][1] (load). The display will again black out and should return at the instant the last byte is accepted, hopefully revealing your saved pattern.

If anything goes wrong, first retry the above steps. Then try various recording and playback levels, or try adjusting the DEMOD trimpot (although this should be non-critical in the majority of cases). As a last resort, you might have to check the modem with a CRO, but be suspicious of external troubles first. Also note that it pays to use good quality cassettes.

That concludes the testing procedure. Now you can look forward to entering and saving much larger programs. Be sure to write down the block loading addresses on the cassette index. It's a good idea to always use "standard" size blocks; e.g. 0200-0300 for a small program; 0200-0400 for a medium; and 0080-0400 to dump all usable RAM. Refrain from dumping/loading 0000-0080, because this area is reserved for CHIPOS's scratchpad and stacks.

Just a final note for perfectionists. The width of the first and last dot (on every row) is controlled by the delay network on H64, (120 ohms, 220R, 220 ohms, .0033uF). If the RHS dots are too narrow, first try increasing C to .0047uF. Also, the frequency of the cassette modulator (2400Hz, marking) can be adjusted by the 5.6k resistor. Speaker volume can be reduced with a series resistor or 500 ohm trimpot.

*This is the complete listing for the CHIPOS interpreter/monitor program.*

```
C000  8D 77 CE 02 00 DF 22 CE 00 5F DF 24 DE 22 EE 00
C010  DF 28 DF 14 BD C0 D0 96 14 84 0F 97 14 8D 21 97
C020  2E DF 2A 96 29 44 44 44 44 8D 15 97 2F CE C0 48
C030  96 28 84 F0 08 08 80 10 24 FA EE 00 AD 00 20 CC
C040  CE 00 2F 08 4A 2A FC A6 00 39 C0 6A C0 A2 C0 AC
C050  C0 BA C0 C1 C0 C8 C0 EE C0 F2 C0 FE C0 CC C0 A7
C060  C0 97 C0 F8 C2 1F C0 D7 C1 5F D6 28 26 25 96 29
C070  81 E0 27 05 81 EE 27 0E 39 4F CE 01 00 A7 00 08
C080  8C 02 00 26 F8 39 30 9E 24 32 97 22 32 97 23 9F
C090  24 35 39 DE 14 6E 00 96 30 5F 9B 15 97 15 D9 14
C0A0  D7 14 DE 14 DF 22 39 DE 14 DF 26 39 30 9E 24 96
C0B0  23 36 96 22 36 9F 24 35 20 E8 96 29 91 2E 27 10
C0C0  39 96 29 91 2E 26 09 39 96 2F 20 F0 96 2F 20 F3
C0D0  DE 22 08 08 DF 22 39 BD C2 97 7D 00 18 27 07 C6
C0E0  A1 D1 29 27 EB 39 C6 9E D1 29 27 D0 20 D5 96 29
C0F0  20 3B 96 29 9B 2E 20 35 8D 38 94 29 20 2F 96 2E

C100  D6 29 C4 0F 26 02 96 2F 5A 26 02 9A 2F 5A 26 02
C110  94 2F 5A 5A 26 0A 7F 00 3F 9B 2F 24 03 7C 00 3F
C120  5A 26 0A 7F 00 3F 90 2F 25 03 7C 00 3F DE 2A A7
C130  00 39 86 C0 97 2C 7C 00 2D DE 2C 96 0D AB 00 A8
C140  FF 97 0D 39 07 C1 79 0A C1 7D 15 C1 82 18 C1 85
C150  1E C1 89 29 C1 93 33 C1 DE 55 C1 FA 65 C2 04 CE
C160  C1 44 C6 09 A6 00 91 29 27 09 08 08 08 5A 26 F4
C170  7E C3 60 EE 01 96 2E 6E 00 96 20 20 B0 BD C2 C4
C180  20 AB 97 20 39 16 7E C2 E1 5F 9B 27 97 27 D9 26
C190  D7 26 39 CE C1 BC 84 0F 08 08 4A 2A FB EE 00 DF
C1A0  1E CE 00 08 DF 26 C6 05 96 1E 84 E0 A7 04 09 86
C1B0  03 79 00 1F 79 00 1E 4A 26 F7 5A 26 EB 39 F6 DF
C1C0  49 25 F3 9F E7 9F 3E D9 E7 CF F7 CF 24 9F F7 DF
C1D0  E7 DF B7 DF D7 DD F2 4F D6 DD F3 CF 93 4F DE 26
C1E0  C6 64 8D 06 C6 0A 8D 02 C6 01 D7 0E 5F 91 0E 25
C1F0  05 5C 90 0E 20 F7 E7 00 08 39 0F 9F 12 8E 00 2F

C200  DE 26 20 09 0F 9F 12 9E 26 34 CE 00 30 D6 2B C4
C210  0F 32 A7 00 08 7C 00 27 5A 2A F6 9E 12 0E 39 D6
C220  29 7F 00 3F DE 26 86 01 97 1C C4 0F 26 02 C6 10
C230  37 DF 14 A6 00 97 1E 7F 00 1F D6 2E C4 07 27 09
C240  74 00 1E 76 00 1F 5A 26 F5 D6 2E 8D 28 96 1E 8D
C250  15 D6 2E CB 08 8D 1E 96 1F 8D 0B 7C 00 2F DE 14
C260  08 33 5A 26 CB 39 16 E8 00 AA 00 E7 00 11 27 04
C270  86 01 97 3F 39 96 2F 84 1F 48 48 48 C4 3F 54 54
C280  54 1B 97 1D DE 1C 39 C6 F0 CE 80 10 6F 01 E7 00
C290  C6 06 E7 01 6F 00 39 8D EE 7F 00 18 8D 55 E6 00
C2A0  8D 15 97 17 C6 0F 8D E1 E6 00 54 54 54 54 8D 07
C2B0  48 48 9B 17 97 17 39 C1 0F 26 02 D7 18 86 FF 4C
C2C0  54 25 FC 39 DF 12 8D BF A6 01 2B 07 48 2A F9 6D
C2D0  00 20 07 8D C2 7D 00 18 26 EC 8D 03 DE 12 39 C6
C2E0  04 D7 21 C6 41 F7 80 12 7D 00 21 26 FB C6 01 F7
C2F0  80 12 39 8D 00 37 C6 C8 5A 01 26 FC 33 39 CE 80

C300  12 C6 3B E7 01 C6 7F E7 00 A7 01 C6 01 E7 00 39
C310  8D 13 A6 00 2B FC 8D DD C6 09 0D 69 00 46 8D D3
C320  5A 26 F7 20 17 DF 12 CE 80 12 39 8D F8 36 6A 00
C330  C6 0A 8D BF A7 00 0D 46 5A 26 F7 32 DE 12 39 20
C340  83 86 37 8D B9 DE 02 39 8D F7 A6 00 8D DD 08 9C
C350  04 26 F7 20 0B 8D EA 8D B7 A7 00 08 9C 04 26 F7
C360  8E 00 7F CE C3 E9 DF 00 86 3F 8D 92 8D 43 0E 8D
C370  CE 4D 2A 10 8D C9 84 03 27 23 4A 27 D8 4A 27 C8
C380  DE 06 6E 00 8D 0C 97 06 8D 06 97 07 8D 23 20 DF
C390  8D AD 48 48 48 48 97 0F 8D A5 9B 0F 39 8D 12 DE
C3A0  06 8D 25 8D 9A 4D 2B 04 8D E8 A7 00 08 DF 06 20
C3B0  EC 86 10 8D 2B CE 01 C8 86 FF BD C0 7D CE 00 06
C3C0  8D 06 08 8D 03 8D 15 39 A6 00 36 44 44 44 44 8D
C3D0  01 32 DF 12 BD C1 93 C6 05 BD C2 24 86 04 9B 2E
C3E0  97 2E 86 1A 97 2F DE 12 39 7A 00 20 7A 00 21 7D
C3F0  80 12 3B DE 00 6E 00 00 C3 F3 00 80 00 83 C3 60
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## TROUBLE-SHOOTING

In the unlikely event that your computer malfunctions, the cause must be either a constructional error or a faulty component. Therefore, proceed to double check the board. Inspect the solder side with a magnifying glass and if any tracks appear to be touching, scrape between them with a sharp pointed instrument. Remember to ground yourself and the board. Look for disoriented components, and incorrect values. Check that all links are present. From here on, it is assumed that the wiring is correct and that your power supply and video monitor are working properly.

The first step is to get the video display generator up. ICs 1, 2, 3, 4, 7 and 9 should be removed at this stage. First check the clock (IC8). There should be 1MHz square waves at pins 7, 13, and 15, and 2MHz at pin 5 (to VDG). Also check RST (pin 14) is high. If trouble, check that the crystal is oscillating (1MHz sine-wave at pin 2), using a x10 probe on your CRO. If not, try it without the L-C tank circuit (150pF/10uH). If no success, you have a bad crystal, or 6875.

If there appears to be some video output, but you can't get the picture to lock, the trouble is probably in your RF modulator. Try reducing the level of the video input signal to the modulator. Also, beware of harmonics; perhaps you have been trying to tune in to a spurious signal eminating from the thing.

Assuming the presence of a 2MHz clock signal, check for horizontal and vertical sync pulses (4us every 64us, and approx. 300us every 20ms, resp.). If no sync, check counter outputs (ICs 15, 14, 13, in that order). Vertical problems could also be caused by IC 13 not resetting or by a faulty one-shot (IC19b). There's not much else that can go wrong with the VDG itself, except when interacting with the MPU.

Having obtained a rock solid white rectangle display, the next step is to check operation with the processor. With all ICs installed, switch on (and reset) the system again. Press a few hex keys. Are the keystrokes being acknowledged with a bleep, but something incoherent is being displayed? If so, do the following, in order given:—

1. Check the LOAD pulse (IC7, pin 9); should be 500 to 800 nanosec, every 8 dot-clock cycles (4us).
2. Remove ICs 1, 2 and 9 (MPU, ROM, PIA); connect BA (IC11, pin 13) to +5V; proceed to check the DMA address bus (outputs of buffers, IC5, 6). The signals should be the same as the respective inputs. Now remove the +5V connection to BA. The outputs should no longer follow the inputs, but "float". If any of the Tristate buffers appear to be faulty, replace it.
3. Re-insert all ICs previously removed. The screen should show RAM contents, usually some kind of vaguely ordered pattern, or random dots. Try grounding WE (IC3, pin 10) momentarily with a jumper lead, a few times, while the system is running. The display should change each time. If not, suspect the 4014 (IC7).
4. Finally, the least likely cause of the above symtoms is a bad EPROM.

At this stage, we are assuming that the video is behaving itself, but a processor malfunction is suspected. With all chips on board, press the [RST] key. The speaker should bleep when the key is held down (even if the PIA is at fault), and the RST line (IC8, pin 14) should go LOW momentarily. If not, check the 2.2uF tantalum capacitor and RST wiring. Note that the Reset function is performed by the 6875. If the system does not appear to be resetting, you could have a faulty EPROM, RAM, MPU or PIA!

(Continued on p125)

# PARTS LIST

*HARDWARE*
1 PC board, 244 x 142mm
1 4.000MHz crystal
1 hexadecimal keypad (4 x 4 matrix)
2 momentary-contact pushbuttons
2 RCA phono sockets
1 small loudspeaker
1 10uH inductor

*SEMICONDUCTORS*
1 6800 microprocessor
1 6821 peripheral interface adaptor
1 6875 clock generator
1 2708 EPROM (programmed with CHIPOS)
2 2114 static RAMs
1 4040B CMOS counter/divider
1 4014B CMOS static shift register
2 74LS04 hex inverter
1 74LS08 quad 2-input gate
1 74LS10 triple 3-input gate
1 74LS11 triple 3-input gate
1 74LS20 dual 4-input gate
1 7440 dual 4-input buffer
1 7474, 74LS74 dual D flipflop
2 7493, 74LS93 binary counter
1 74121 one-shot multivibrator
1 74123 dual one-shot
2 74LS367 Tristate buffer
1 566 function generator
1 741 operational amplifier
1 2N3643 NPN transistor
1 2N4250 PNP transistor
6 1N4148 silicon diodes

*IC Sockets*
2 40 pin
1 24 pin
2 18 pin
3 16 pin
1 16 pin DIL plug

*CAPACITORS*
2 10uF/16VW aluminium electrolytic
1 10uF/16VW tantalum electrolytic
1 2.2uF tantalum electrolytic
12 0.1uF polyester or ceramic
1 .033uF polyester
1 .022uF polyester
2 .01uF polyester
1 .0033uF polyester
1 .001uF polyester
2 150pF ceramic
1 47pF ceramic or polystyrene

*RESISTORS*
(¼W, 10% tolerance)
2 x 22k, 5 x 10k, 1 x 6.8k, 1 x 5.6k, 2 x 4.7k, 5 x 2.2k, 3 x 1.5k, 1 x 1k, 2 x 470 ohms, 2 x 120 ohms, 1 x 75 ohms (or 2 x 150 ohms), 1 x 74 ohms.
1 5k trimpot (vertical mounting)

*MISCELLANEOUS*
Ribbon cable, tipped copper wire, spaghetti sleeving, shielded cable, PC pins, 22g solder, 3 extra DIL plugs and sockets (if required for expansions).

## DREAM . . . from page 88

Check that the MPU address lines are all HIGH (except A0) when RST is LOW (hold down [RST]). Before trying a new MPU chip, note that any faulty device on the address bus might be holding a bus line LOW (incl. ICs 5, 6).

Assuming the actual reset circuit is operating, but CHIPOS refuses to spring to life (i.e. no 4-digit readout on screen, or no keypad response), the fault is almost certainly in EPROM or RAM, or the associated select logic. Less likely is a bad PIA, but this can be checked. If you have a good display, but no I/O response, check the PIA initialization. After resetting, PB0 is HIGH, PB1-PB7 are all LOW, PA0-PA3 HIGH, and PA4-PA7 LOW. When a hex key is pressed, the PAx lines will reverse momentarily, if CHIPOS and the PIA are both operating.

If you have an acquaintance who is also constructing a DREAM-6800, see if you can arrange to borrow the MPU, RAM, EPROM, and PIA chips. One by one, substitute a chip for one of your own.

In conclusion, it must be said that, provided due care is taken in construction, the probability of success at switch-on is very high. Readers who are contemplating the project, should not be put off by the trouble-shooting section, which was included to help isolate rare, hard-to-find bugs. Problems of a minor nature should be able to be handled by enthusiasts with a moderate amount of experience, with the help of the theory-of-operation section.

*(To be continued)*