L. SHUSTEK

"IT'S A HOBBY"

Yes, a hobby for fun. Interest in home computing is spreading fast. I feel our club is doing a good job in supporting the individual experimenter get his or her system up and flying. There are a lot of obstacles, bugs, and technical tricky problems which can frustrate and discourage a person alone. By sharing our experience and exchanging tips we advance the state of the art and make low cost home computing possible for more folks.

Bring your beast in for a demo! Can it sing or play games? What tricks does it know? Let's have a look at it.

Thanks to Ray and Karen for demonstrating his 008A Microcomputer with audio cassette adapter at the May 14th meeting. Using an 8008 microprocessor, the 008A is available as a kit ($375) from RGS Electronics 3650 Charles St. Suite K, Santa Clara, Ca. Recently Ray got Jerry's TVTypewriter I working nicely.

Thanks to Gordon for bringing and explaining his text editing system May 28th. The system's beauty is the ease with which one can look into 16 K of storage and find what's there to be re-arranged as you please. The only thing I missed in playing REVERSE on it were the bells congratulating me when I'd won. A computer game without bells is like a steam engine without a whistle!

A special thanks to Wayne for bringing the club a paper tape version of a Fortran IV cross assembler for the 8008 and PL/M on mag tape, and two listings of the resident 8080 and 8008 assemblers. The club now has a responsibility to use this software in a non-profit manner, which means no private or commercial deals. If you have a system large enough to house a copy of the mag tape and can make access available to the rest of the members, contact Gordon French.

Wayne also brought a TV terminal Intel developed two years ago as a demonstration unit. The unit uses a 4004 microprocessor and has both a character and a plot mode (5 x 7 dot square you can move around). Wayne hooked it up to a TV and tuned it in on the edge of channel 6. The current ROM gave us our choice of tic-tac-toe or tennis. We played both.

At the previous gathering Wayne had suggested using a shadow ROM for bootstrapping when you first turn on your computer. This time on request he drew a schematic on the greenboard, but I don't think many of the less technically oriented among us followed his explanation completely. Which brings me to a general observation: The club is quite a mixed group. We are composed of outright novices to top flight professionals and leaders in the industry. Many are somewhere inbetween. Only a few are strong in both hardware and software.

Drawing by Fritz
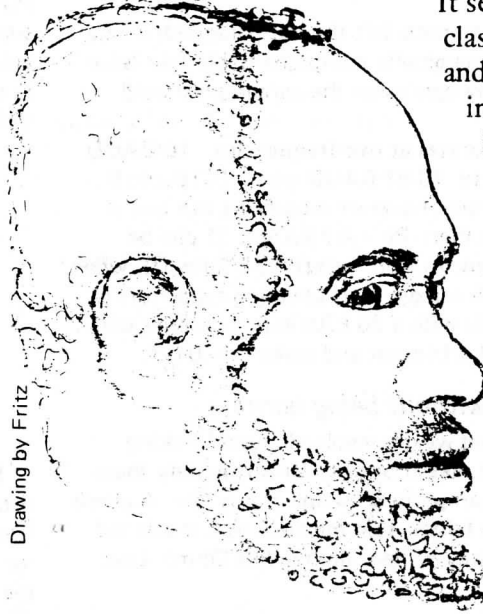
Wayne

It seems to me, we need classes or some more patient and detailed means of conveying information across an ignorance gap, and at the same time not bore the more experienced among us. I think our size is large enough now that after meeting as a whole from say 7 to 9 pm, we then break into three or four small groups for more educationally oriented discussions for an hour. Anyone have comments on this? Perhaps there is enough learning taking place as it is and any attempt to optimize it further will upset the relaxed informality of the gatherings. Comments?

Thanks to John Draper for setting up a group library account for the club at Call Computer. Those who have accounts, have your number changed to a K-2?? number. If we have enough join, the club won't be charged the $5.00 monthly base rate. (We also pay 63 cents per thousand characters on file permonth.) The intention is to have useful programs stored in the K-200 library file.

Thanks to Dan for testing the 2102's the group purchased from Solid State Music. Thanks to Lenny and Frank for setting up the auditorium for our use. Much thanks and appreciation to everyone for your time, energy, and spirit in making the club what it is.

The MITS MOBILE came to Rickey's Hyatt House in Palo Alto June 5th & 6th. The room was packed (150+) with amateurs and experimenters eager to find out about this new electronic toy. The evidence is overwhelming that people want computers, probably for self-entertainment and educational usage. Why did the Big Companies miss this market? They were busy selling overpriced machines to each other (and the government and military). They don't want to sell directly to the public. I'm all in favor of the splash MITS is having with the Altair because it will do three things: (1) force the awakening of other companies to the demand for low-cost computers for use in the home, which will mean competition, resulting in lower prices just as happened with the hand held calculator. (2) cause local computer clubs and hobby groups to form to fill the technical knowledge vacuum. (3) help demystify computers. Computers are not magic. And it is important for the general public to begin to understand the limits of these machines and that humans are responsible for the programming.

DESIGN NOTES by

Terry Lee, Consulting Engineer, Temar Electronics
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San Francisco, Ca. 94115

The process leading from pen to press left the last paragraph of my discussion on the "SART" only marginally comprehensable (see Issue number three). To clear away any confusion the paragraph should have appeared as follows:

IC9 is the receiver clock, it operates at two frequencies: 16·BAUD when IC10, pin 5 is at logic 0 and 10.67·BAUD when IC10, pin 5 is logic 1. I have given typical values, however modifying this one is a bit tricky. If $R_A = R_B < 50 k\Omega$ then $R_C = 4.7 k\Omega$ and C can be selected to give the proper frequency. F(in Hertz) = 77/C (in μf), when $R_A = R_B = 10 k\Omega$ and IC10, pin 5 is logic 0. If selecting capacitors is not to your liking try replacing R_C with a 20 kΩ trimpot in series with a 1.5 kΩ resistor, R_B with a 100 kΩ trimpot and make C = .01μf.

How to Heat Sink without being burnt

From time to time it seems that we get involved in heat sinking transistors and integrated circuits, like it or not. Unfortunately there is little understanding of how to properly accomplish this job. A client of mine, that should have known better, told me once that it was too bad that there existed no simple key to heat sinking like Ohm's Law.
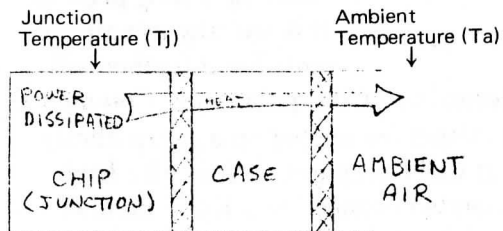
Fig. 1 Thermal Resistance Junction to case (θjc)   Thermal Resistance Case to air (θca)
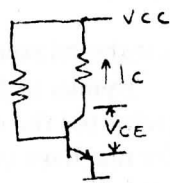
Fig. 2

Actually there is a simple key, Let's look at Fig. 1. Basically heat is generated in a chip when current passes through it. This heat is the direct result of the power dissipation (PD). In Fig. 2 PD$\approx$Vce·Ic. PD is commonly expressed in watts. It is important to note that all this power is dissipated in the form of heat, 1 watt = 3.412 BTU/hour. At any rate the heat generated, equivalent to PD, must be conducted away from the chip or the junction temperature (Tj) will rise until the chip is destroyed. This heat must pass from the chip to the case and from the case to the outside air. The quality of the materials that impede this flow is called thermal resistance (θ). The total θ in a system is the sum of all individual thermal resistances. When using a heat sink, see Fig. 3, θca is reduced because a heat sink can radiate heat much more efficiently than the case of a device. The flow of heat in a system is proportional to the thermal resistance. Since the heat generated is that which flows, we represent the flow of heat by PD. We now have PD = temp. drop/θ. Not only is the key simple, it is exactly like Ohm's Law!

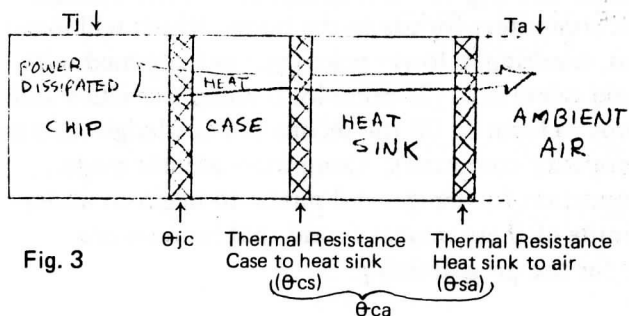Fig. 3 θjc   Thermal Resistance Case to heat sink (θcs)   Thermal Resistance Heat sink to air (θsa) θca

Returning to Fig. 2, let's suppose we have a 2N3055 whose relevant charactorics are listed in Fig. 4, what is its PDmax without a heat sink? PDmax = (Tjmax − Tamax)/ θja ; for this we will assume Ta = 40° C, θja = θjc + θca. From Fig. 5 θca = 32° C/W. Hence PDmax = (200 − 40)/(1.5 + 32) = 4.8 watts. Occasionally θjc is not supplied, if it is not, PDmax @ Ta will be listed as in Fig. 5. To calculate θjc one must assume a perfect heat sink, θcs + θsa = O in order to achieve PDmax. θjc = (Tjmax − Ta)/PDmax = (200 − 25)/117 = 1.496°C/W.

PDmax @ 25° C = 117 watts
Case style = TO-3
Tjmax = 200°C
θjc = 1.5°C/W

Fig. 4

Fig. 6

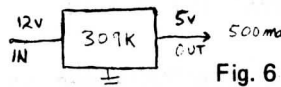| Case style	θca (natural convection)
TO-3	32°C/W
TO-220	46°C/W
TO-39	130°C/W
TO-5	160°C/W
TO-8	93°C/W
TO-18	250°C/W
TO-66	40°C/W

Fig. 5

Suppose now we take an IC regulator, LM309K. From National Semi's data sheet the case is TO-3, θjc = 3.0°C/W and Tjmax = 125°C. It should be noted that θjc cannot be calculated from PDmax because for most IC regulators, PDmax is internally limited to a figure less than the theoretical maximum. For the circuit shown in Fig. 6 PD = .5(12 − 5) = 3.5 watts. Assume a Tamax = 55°C. θjamax = (125 − 55)/3.5 = 20°C/W. One would need a heat sink because without one θja = 35°c/W which is too large. In order for this circuit to operate properly a heat sink with a θca <17°C/W is required. Commercial heat sinks are well documented. An IERC # LATO3 heat sink has a θsa = 10°C/W (natural convection). We know everything except θcs; Fig. 7 lists typical values. Using the Above mentioned heat sink, θja for the IC regulator would equal 13.5°C/W, which is adequate since it is less than θjamax calculated above. This is all well and good you may say but the chasis which you intend to use didn't come with a thermal resistance stamped on it. For such problems I have provided Fig. 8. If the regulator discussed above is to mounted on the back side of a 3/16" aluminium chasis, the minimum exposed area should be 2sq. in.

This is about it, although there is much more detail possible, I believe this approach should keep all stray fusings at bay.

TO-3 TO-220 (TO-5)	θcs °C/W	
washer	dry	with silicon grease
none	.2 (.8)	.1 (.4)
mica	.8	.4
anodized al.	.4	.3

Fig. 7

Fig. 8

surface area in square inches of aluminum

θsa (natural convection)

VERT 3/32" THICK
HORIZ + VERT. 3/16"
HORIZ 3/32"
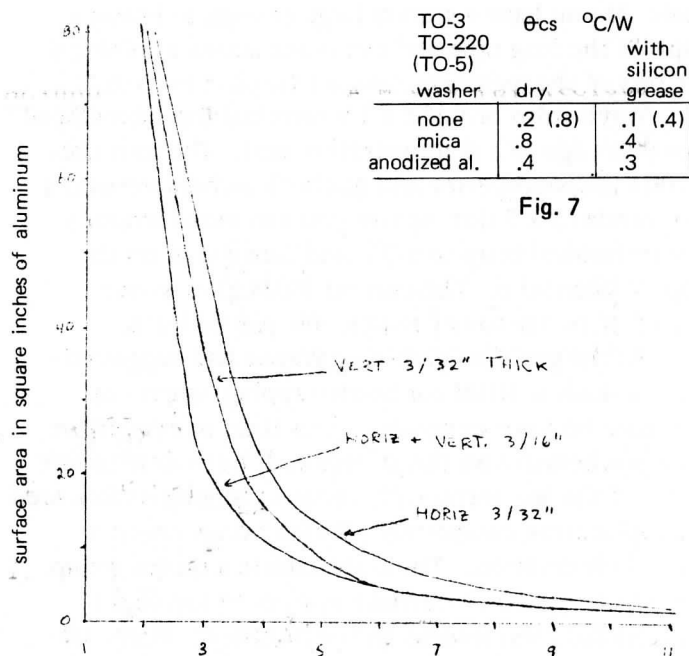
CLUB NOTES - FROM GORDON FRENCH

    JUDGING FROM THE SHOW OF HANDS THERE ARE ABOUT A DOZEN ALTAIR'S
IN SOME STAGE OF COMPLETION IN THE CLUB. JUST THIS EVENING I GOT A
CALL FROM ONE OF MY CRONIES WHO ORDERED HIS INTERFACE WITH HIS ALTAIR
AND ALTHOUGH HE HAS HIS MACHINE, THE I/O BOARD IS STILL TO COME. AND
SINCE FRED WANTED ME TO DO A LITTLE PIECE, I THOUGHT ABOUT THE RANDOM
NUMBER GENERATOR THAT WAS PUBLISHED IN THE COMPUTER HOBBIEST THIS LAST
ISSUE. WHEN YOU TIRE OF LISTENING TO FOOL ON THE HILL YOU MIGHT TRY
TO MESS AROUND WITH THIS. FOR THE 8008 FAITHFUL I WILL GIVE A PARRALLEL
LISTING. YOU WILL CALL THIS AS A SUBROUTINE.

        JIM PARKER'S RANDOM NUMBER GENERATOR ROUTINE
        FROM "THE COMPUTER HOBBYIEST" (VOL.1 NUMBER 5)

8080   8008

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000100/ 041 LXI, SHIFT+3         000100/ 056 LHI 000
000101/ 146                      000101/ 000
000102/ 000                      000102/ 066 LLI 147 SHIFT+3
                                 000103/ 147
000103/ 006 MVI,B,8              000104/ 015 LBI 010
000104/ 010                      000105/ 010
000105/ 176 MOV A,M              000106/ 307 LAM
000106/ 007 RLC (TAG-RTOP)       000107/ 002 RLC
000107/ 007 RLC                  000110/ 002 RLC
000110/ 007 RLC                  000111/ 002 RLC
000111/ 256 XRA,M                000112/ 257 XRM
000112/ 027 RAL                  000113/ 022 RAL
000113/ 027 RAL                  000114/ 022 RAL
000114/ 055 DCR,L                000115/ 061 DCL
000115/ 055 DCR,L                000116/ 061 DCL
000116/ 055 DCR,L                000117/ 061 DCL
000117/ 176 MOV A,M              000120/ 307 LAM
000120/ 027 RAL                  000121/ 022 RAL
000121/ 167 MOV M,A              000122/ 370 LMA
000122/ 054 INR,L                000123/ 060 INL
000123/ 176 MOV A,M              000124/ 307 LAM
000124/ 027 RAL                  000125/ 022 RAL
000125/ 167 MOV M,A              000126/ 370 LMA
000126/ 054 INR,L                000127/ 060 INL
000127/ 176 MOV A,M              000130/ 307 LAM
000130/ 027 RAL                  000131/ 022 RAL
000131/ 167 MOV M,A              000132/ 370 LMA
000132/ 054 INR,L                000133/ 060 INL
000133/ 176 MOV A,M              000134/ 307 LAM
000134/ 027 RAL                  000135/ 022 RAL
000135/ 167 MOV M,A              000136/ 370 LMA
000136/ 005 DCR,E                000137/ 011 DCB
000137/ 302 JNZ,RTOP             000140/ 110 JFZ 000107
000140/ 106                      000141/ 107
000141/ 000                      000142/ 000
000142/ 311 RET                  000143/ 007 RET
(TAG THE NEXT LOCATION "SHIFT")
000143/ 123 SET TO ANY VALUE     000144/ 123 SET TO ANY VALUE
000144/ 123 SET TO ANY VALUE     000145/ 123 SET TO ANY VALUE
000145/ 123 SET TO ANY VALUE     000146/ 123 SET TO ANY VALUE
000146/ 123 SET TO ANY VALUE     000147/ 123 SET TO ANY VALUE
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    I ENTERED THIS ROUTINE STRAIGHT FROM THE MAGAZINE AND IT WORKS
BEAUTIFULLY. "TRY IT YOU'LL LIKE IT". FOR MORE INFORMATION, READ
THE ARTICLE THAT THE COMPUTER HOBBYIST PUBLISHED. THEIR ADDRESS
IS: THE COMPUTER HOBBYST
               BOX 295
               CARY, NC. 27511
    I THOUGHT UP MY OWN WAYS TO PLAY WITH THE ROUTINE. TRY SOME OF
YOUR OWN. IT'S FUN.
    MANY THANKS TO JIM PARKER, FOR A REALLY NEAT GENERATOR THAT
WORKS JUST GREAT! THANKS TOO, TO ED HALL WHO CHECKED OUT THE 8080
CODE FOR ME. FOR A BEARDED SOFTWARE MAN, YOU'RE OK, ED!

Club Treasury Report:

INCOME: We collected $21.00 May 14 and $17.00 May 28. Total income: $38.00.

EXPENSES: Third newsletter copying cost $24.00, postage $12.90. Total expenses: $36.90.

OLD BALANCE: May 14, 1975, $46.48.

NEW BALANCE: As of June 5, 1975, $47.48. Cost and mailing of this newsletter has not been deducted. About 200 will be printed and mailed out which will bring the balance close to zero or below. We request a dollar donation from all new attenders of the club. Other donations are most welcome. Also, anyone who has not filled out a Club Survey Questionaire, please do; this lets the rest of us know you are an active member. We need some good suggestions for raising money for the club besides taxing ourselves.

NEXT MEETING: WEDNESDAY, JUNE 11

7 PM at Stanford Linear Accelerator Center in the Auditorium. Directions: From Freeway 280 take the Sand Hill Road exit east toward Menlo Park. At sign: SLAC, turn right. Auditorium is directly ahead. Parking area to your right. We will meet here every two weeks (June 25, July 9, etc.). I'll send out a post card if there are changes. See you there.

San Francisco - Berkeley Chapter meets June 18 at Lawrence Hall of Science in Berkeley, 7:30 pm.

Sonoma County Minicomputer Club
meets every Thursday at 7:30 pm at 170 East Cotati Avenue Suite H, in Cotati, Ca. (near Santa Rosa). Meeting place may change so call LOOP Center 707-795-0405 or Mark Robinson, President, at home 707-525-1659 or at work 707-544-2865.

Solid State Music
2102 A Walsh Avenue
Santa Clara, Ca. 95050
tel. 408 - 246 - 2707
John Burgoon makes this limited time offer to the club:
100 2602/2102 for $200.00 These have been tested to be functionally ok at 500 kilo Hertz with no excessive leakage. Will work in an Altair or Mark-8 type computer.
Also: 4K memory board bare for $17
4K memory board wired and tested $163.80.
8 1101 for $8.00.
Cyber-comm desk, power supply & card rack $75.00
Best prices on TTL, CMOS, MOS, Linears, etc.
Open 6 pm to 9pm Mon. - Fridays, Sat. 10 - 5.

The Digital Group is sending out a free Flyer which will list current announcements and previews of new products. And the Digital Group Clearinghouse will be putting out a newsletter available for $6.00 per year (12 issues). Contact: The Digital Group P. O. Box 6528 Denver, Colorado 80206

I got an enthusiastic letter from Carl Helmers announcing a new magazine for the computer experimenter: **BYTE!** An arrangement has been made with Wayne Green who publishes **73** magazine for amateur radio hams to handle the business and copy preparation (8½ x 11 formate, glossy paper). The first issue is scheduled to be mailed in mid-July. Subscription rate is $12.00 for 12 issues ($10.00 introductory). Inquiry should be directed to: **BYTE!** Green Publishing, Inc. Peterborough, N.H. 03458

The S.F. - Berkeley Chapter of the Homebrew Computer Club met June 4th at the Lawrence Hall of Science in the Berkeley hills. The topic focused on was computer based community memories and how such systems are best used. Discussion and questions located concepts such as: Networks, Rain Forest, Platonic Form, Member/economics, computer utility, distributed memory, interconnecting indices, etc., which may be explored more fully at some future date. Thanks to Lee for initiating the topic and bringing people together on it. Thanks to Pete for making the Hall available to the club.

Altair OS Software needed for building automation applications: disk driver, analog cassete handler, high speed paper tape read/punch, line printer handler. Contact: John Drace Stanford Med. Ctr. 493-7829.