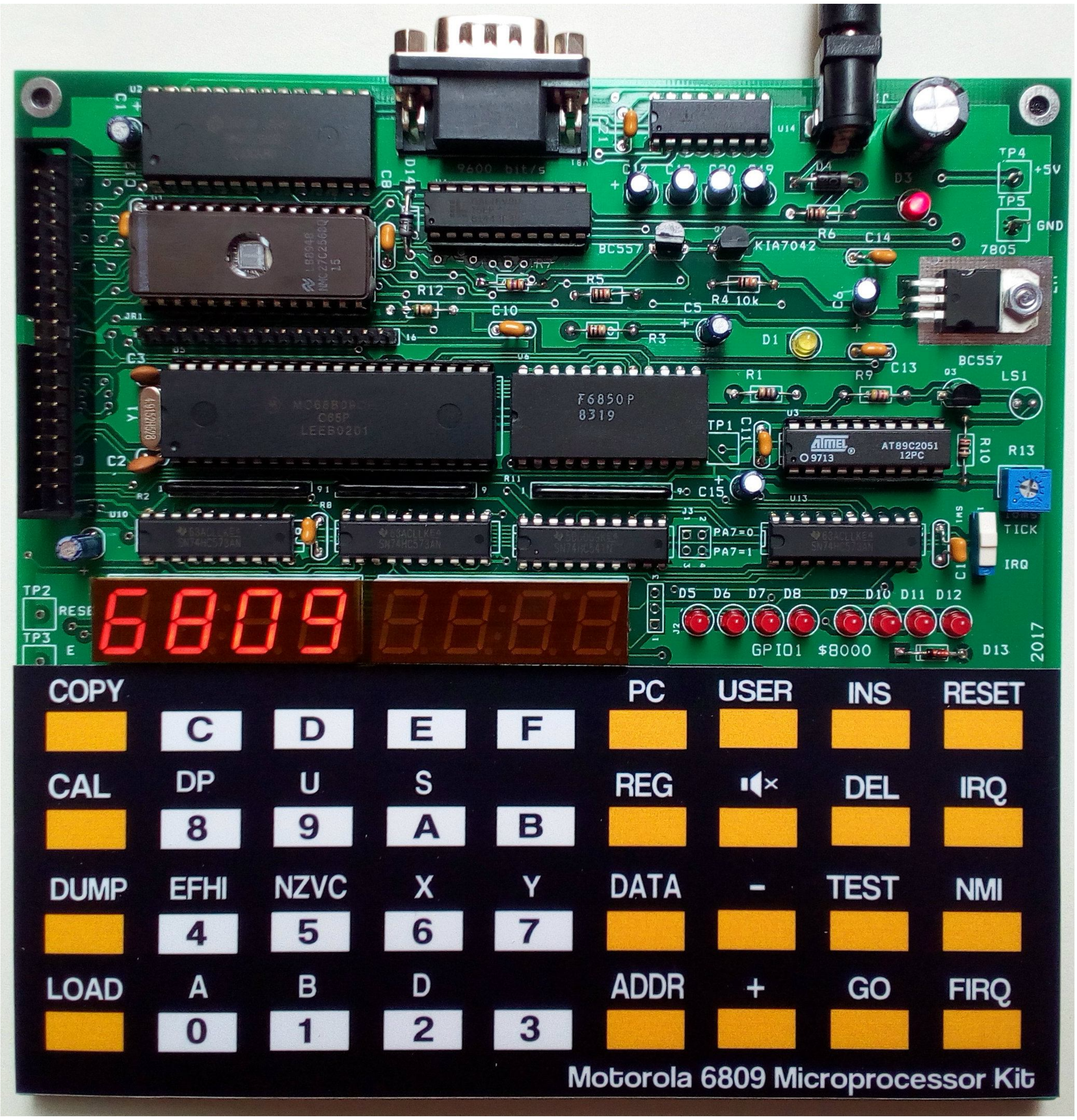
6809 Microprocessor Kit User's Manual



Rev 1.0, April 2020

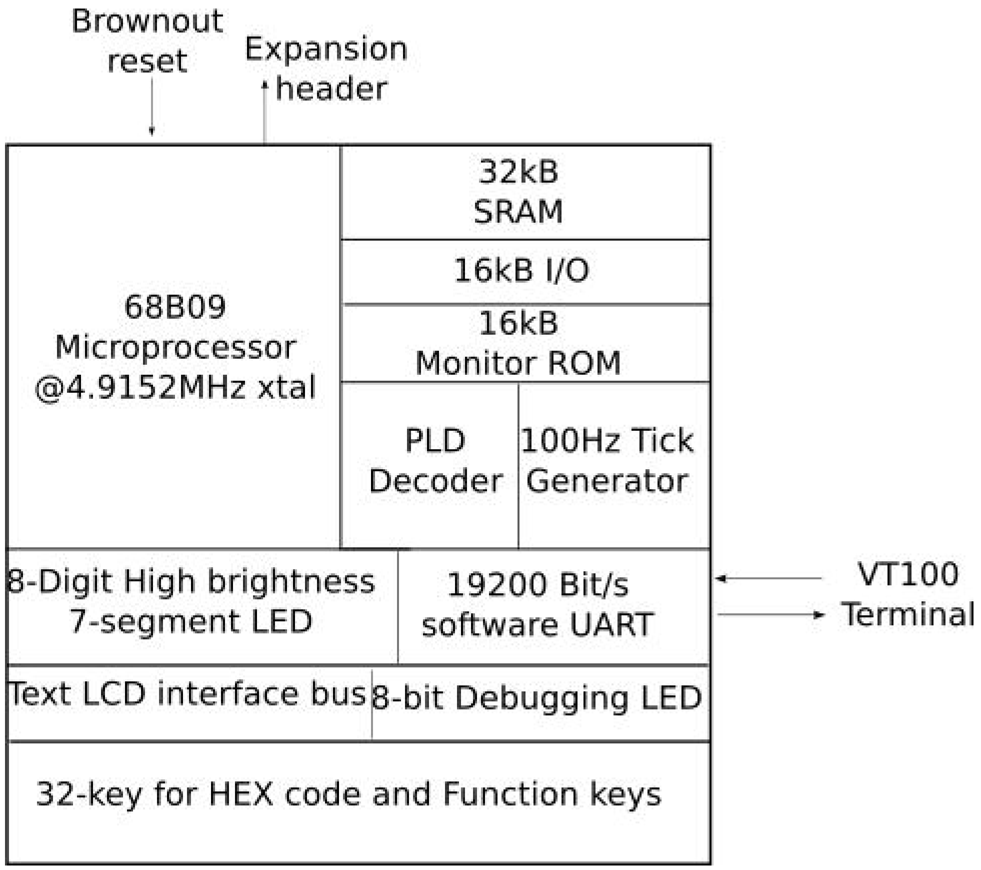
6809 MICROPROCESSOR KIT

CONTENTS

OVERVIEW

The 6809 Microprocessor kit is a single board microcomputer designed for self learning the operation of the 6809 microprocessor. We can enter the 6809 instructions using hex key directly. The kit provides 32kB RAM for program testing. The 16kB ROM is monitor program. Tick generator provides 10ms tick signal for testing with interrupt. In addition, the UART provides serial interface for Motorola s-record loading.

FUNCTIONAL BLOCK DIAGRAM



Notes

1. UART speed is 19200 bit/s.

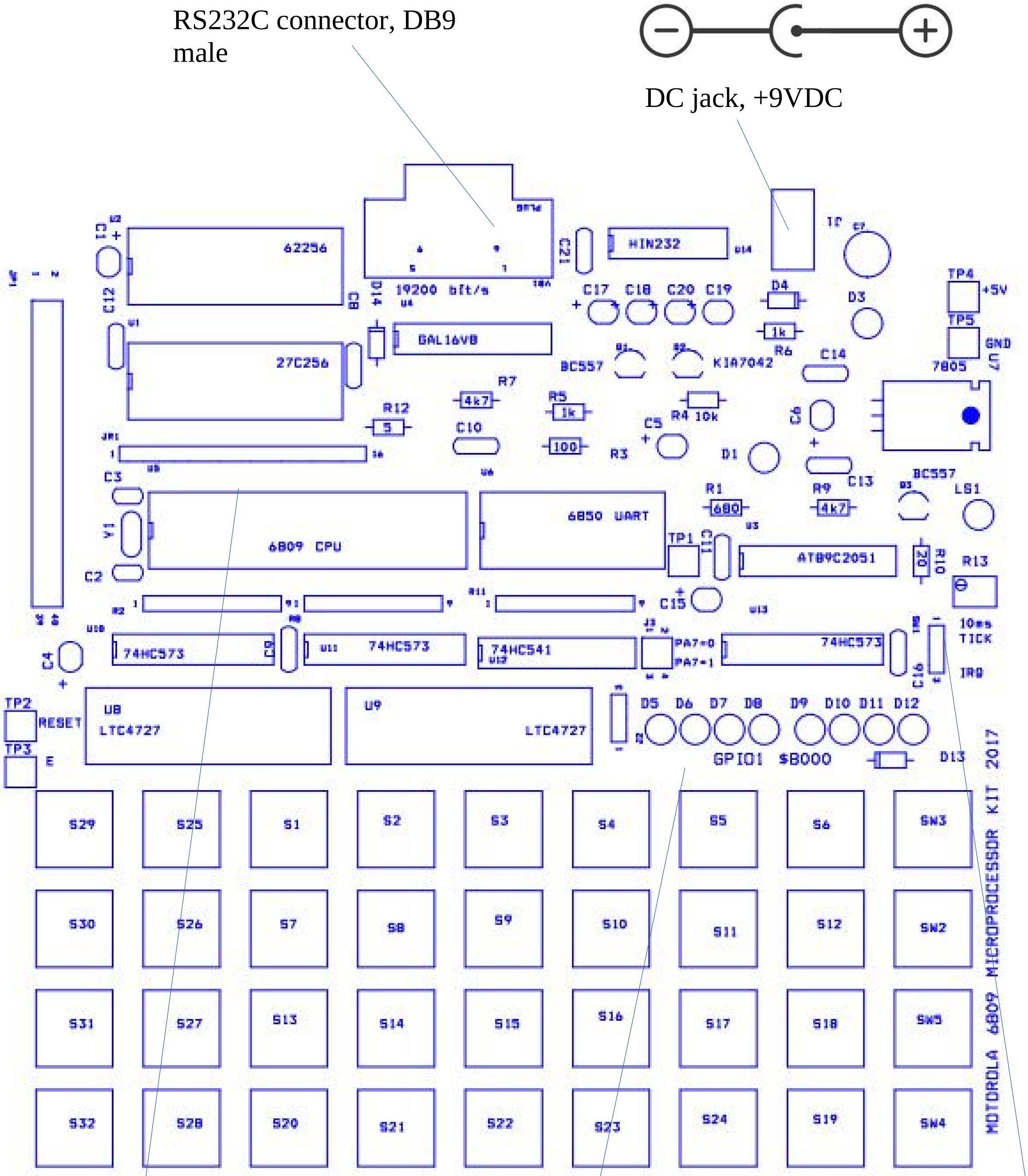
2. The kit has LCD module interfacing with 6809 bus.

3. 100Hz Tick generator is for interrupt experiment.

4. Ports for display and keypad interfacing are built with discrete logic IC chips.

5. Memory and Port decoders are made with Programmable Logic Device, PLD.

HARDWARE LAYOUT


62256
27C256
19200 bit/s
GAL16V8
HIN232
6809 CPU
6850 UART
AT89C2051
74HC573
74HC573
74HC541
74HC573
LTC4727
LTC4727
7805
BC557
KIA7042
BC557
+5V
GND
RESET
E
PA7=0
PA7=1
10ms TICK
IRQ
D5 D6 D7 D8 D9 D10 D11 D12
GPIO1 $8000
MOTOROLA 6809 MICROPROCESSOR KIT 2017
S29 S25 S1 S2 S3 S4 S5 S6 SW3
S30 S26 S7 S8 S9 S10 S11 S12 SW2
S31 S27 S13 S14 S15 S16 S17 S18 SW5
S32 S28 S20 S21 S22 S23 S24 S19 SW4

RS232C connector, DB9 male

DC jack, +9VDC

16-pin Text LCD header.

GPIO1 LED, 8-bit binary display (address is $8000)

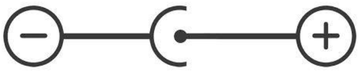
Selector for 10ms tick or IRQ key

Important Notes

1. Insert or remove the LCD module must be done when the kit is powered off!

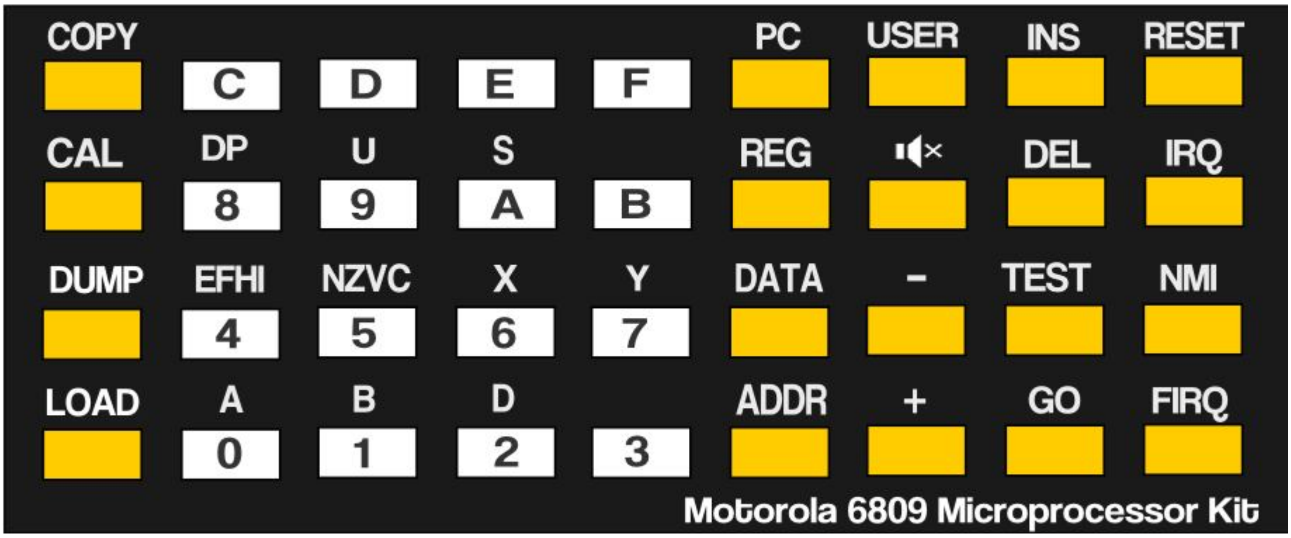
2. AC adapter should provide approx. +9VDC, higher voltage will cause the voltage regulator chip becomes hot.

3. The kit has diode protection for wrong polarity of adapter jack. If the center pin is not the positive (+), the diode will be reverse bias, preventing wrong polarity feeding to the voltage regulator.



4. The USB to 9VDC adapter can be powered the kit as well.

KEYBOARD LAYOUT



HEX keys Hexadecimal number 0 to F with associated user registers, A, B, D, X, Y, DP, U, S and flag bits, EFHI, NZVC

CPU control keys

RESET Reset the CPU, the 6809 will get vector from location $FFFE. Kit provides the restart address at $C000.

IRQ Make IRQ pin to logic low, used for experimenting with interrupt process

NMI Make NMI pin to logic low, used for experimenting with interrupt process

FIRQ Make FIRQ pin to logic low, used for experimenting with interrupt process

Monitor function keys

TEST Test 10ms tick interrupt, SW1 must be 10ms Tick position. Display shows hex number counting, the GPIO1 LED shows binary counting at 100Hz rate.

INS Insert one byte to the next location, the 512 bytes will be shifted down.

DEL Delete one byte at current display, the next 512 bytes will be moved up.

SPKR Turn off/On BEEP key

GO Jump from monitor program to user code at current ADDRESS

- Decrement current display address by one

+ Increment current display address by one

PC Set display address to the current Program Counter

REG Display user registers, used with HEX key.

0	A register
1	B register
2	D, or AB 16 bits register
4	Flag bits, EFHI, Condition Code high nibble
5	Flag bits, NZVC, Condition Code low nibble
6	X register
7	Y register
8	DP register
9	U register
A	S register

DATA Set entry mode of hex keys to Data field

ADDR Set entry mode of hex keys to Address field

COPY Copy Block of memory, Enter start Address, used with key +, End address, and Destination, press key GO to copy then.

CAL Calculate hex number addition +, or subtraction -, used with key +, or key -. Key GO will compute.

DUMP Dump block memory using terminal display. Ket will need 19200 bit/s terminal interface.

LOAD Load Motorola s-record. Set delay 1ms for character and line.

USER User key, for user define the function. See the monitor source code in function key_exe( ).

HARDWARE FEATURES

Hardware features:

-CPU: Motorola 68B09, 8-bit Microprocessor @1.2288MHz instruction clock
-Memory: 32kB RAM, 16kB EPROM
-Memory and I/O Decoder chip: Programmable Logic Device GAL16V8D
-Display: high brightness 6-digit 7-segment LED
-Keyboard: 36 keys
-RS232 port: 6850 ACIA 19200 bit/s 8n1
-Debugging LED: 8-bit GPIO1 LED at location $8000
-Tick: 10ms tick produced by 89C2051 for time trigger experiment
-Text LCD interface: direct CPU bus interface text LCD
-Brownout reset: KIA7042 reset chip for power brownout reset
-Expansion header: 40-pin header

MONITOR PROGRAM FEATURES

MONITOR program features:

-Simple hex code entering
-Insert and Delete byte
-User registers: A, B, X, Y, S, U, DP Condition code registers for storing CPU status after program execution
-HEX calculator for offset calculation
-Copy block of memory
-Motorola s-record S19 downloading
-Memory dump
-Beep ON/OFF
-TEST 10ms

MEMORY AND I/O MAPS

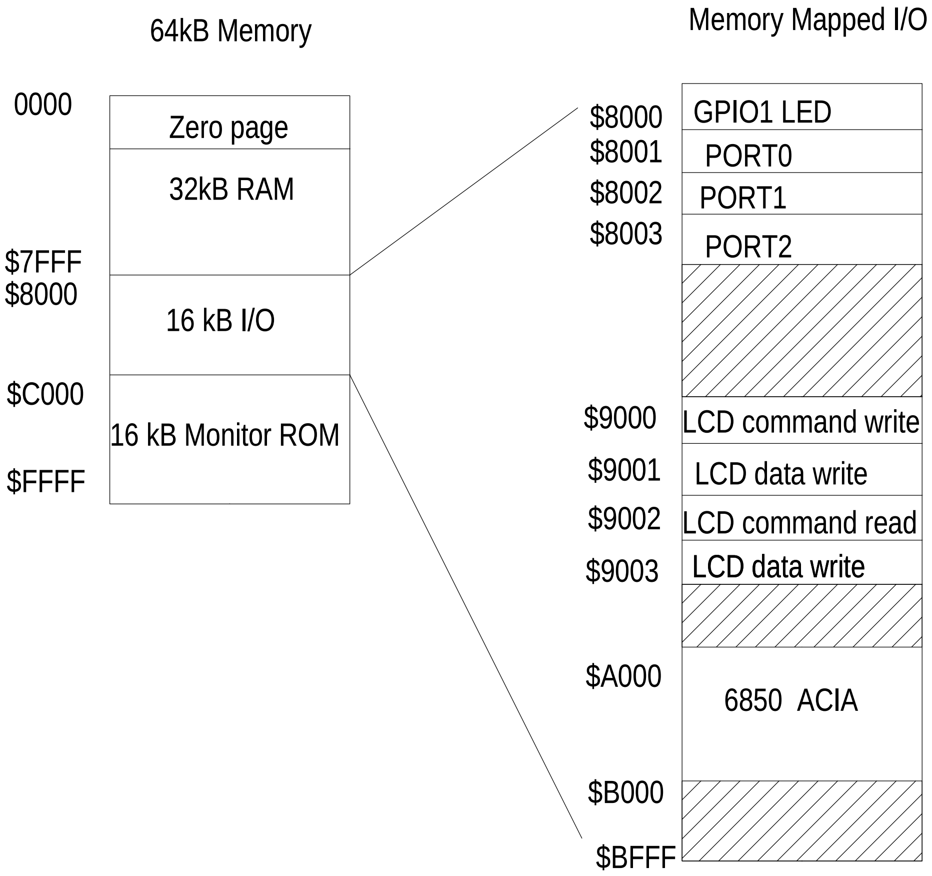
The 6809 chip can address up to 64kB using 16-bit address bus. The 64kB spaces are divided into 32kB RAM, 16kB memory mapped input/output, and 16 kB monitor ROM.

RAM starts from 0 to $7FFF. The input/output starts from $8000 to $BFFF.

GPIO1 LED is the 8-bit binary display, useful for program debugging. The location is $8000.

To see the contents of Accumulator A,

```
0200 86 AA           LDA #$AA
0202 B7 80 00        STA $8000
0205 3F              SWI
```



INTERRUPT VECTORS

Interrupts vectors are placed at high address from FFF0 to FFFF.

Restart interrupt vector, C000 is placed at FFFE and FFFF.

Interrupts	Vector location		6809 kit
	MS byte	LS byte	
Reset	FFFE	FFFF	C000
NMI	FFFC	FFFD	7FF3
SWI	FFFA	FFFB	C027
IRQ	FFF8	FFF9	7FF0
FIRQ	FFF6	FFF7	7FF6
SWI2	FFF4	FFF5	NA
SWI3	FFF2	FFF3	NA
Reserved	FFF0	FFF1	NA

SWI sofware interrupt, is used by monitor program to provide break-point running, by saving the CPU registers to user registers. The service routine is address C027.

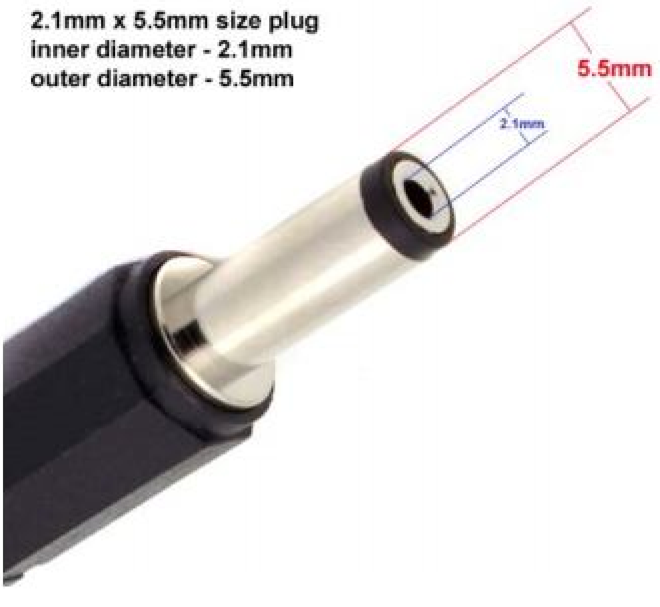
NMI vector is relocated to RAM space, at 7FF3. Reset the kit, the instruction RTI code, 3b is put to address 7FF3. Students may replace it with the code to service the NMI directly.

Similarly to the FIRQ. We can check it with key ADDR and see these vectors easily.

GETTING STARTED

The kit accepts DC power supply with minimum voltage of +7.5V. It draws DC current approx. 300mA. However we can use +9VDC from any AC adapter. The example of AC adapter is shown below.

The center pin is positive. The outer is GND.



If your adapter is adjustable output voltage, try with approx. +9V. Higher voltage will make higher power loss at the voltage regulator, 7805. Dropping voltage across 7805 is approx. +2V. To get +5VDC for the kit, we thus need DC input >+7.5V.

When power up, we will see the text 6809.

```
6809
```

Press PC key, the display address will be 200. The data field will show its content.

```
0200 FF.
```

HOW TO ENTER PROGRAM USING HEX CODE

Let us try enter HEX CODE of the example program to the memory and test it. We write the program with 6809 instructions.

Address	Hex code	Label	Instruction	comment
0200	86 AA	MAIN	LDA #$AA	Load A with value AA
0202	B7 80 00		STA $8000	Write A to GPIO1 @ 8000
0205	3F		SWI	Jump back to monitor

Our test program has only three instructions.

The first instruction is

```
LDA #$AA
```

Load A register with the 8-bit constant, AA or 10101010 in binary.

This instruction has two bytes hex code i.e., 86, and AA. 86 is instruction LDA #n and AA is n.

The 2nd instruction is

`STA $8000`. Store A register to, gpio1 LED at location $8000.

The instruction's machine code is B7. 80 00 is the location of GPIO1.

The last instruction is SWI, software interrupt. The hex code is 3F. It will jump back to monitor program.

The total of hex codes for this small program is 6 bytes that are, 86, AA, B7, 80, 00 and 3F.

The first byte will be entered to location 0200. And the following bytes will be entered at 0201, 0202, 0203, 0204, 0205. The last byte is 3F at 205.

Let us see how to enter these codes into the memory.

Step 1 Press RESET then key PC, the display will show current memory address and its contents.

```
0200 FF.
```

Shown the location 200 has data FF. There are small dots at the data field indicating the active field, ready for modifying the hex contents.

Step 2 Press key 8 and key 6. The new hex code 86 will be entered to the location 200.

```
0200 86.
```

Step 3 Press key + to increment the location from 200 to 201. Then enter hex key A, A.

```
0201 AA.
```

Repeat Step 3 until completed for the last location. We can verify the hex code with key + or key -.

To change the display location, press key ADDR. The dots will move to Address field. Any hex key pressed will change the display address.

USER REGISTERS DISPLAY

Before we test the code running, let us see how to examine user registers. User registers are the memory block in RAM that used to save the contents of CPU registers after completed a given program running. We can examine the user registers for checking our code running then.

Press key REG, then press key 0, it will show 8-bit content of register A.

```
  FF A
```

For example, Key 0 to Key 3 are for A, B, AB or D..

Press key Reg, 4, 5, 6, 7 for Flag low nibble, high nibble, X and Y registers.

```
FCEF   Y
```

TEST CODE RUNNING WITH BREAK POINT

Let us get back to the program we have just entered. The simple program loads accumulator A with AA and stores it to GPIO1 LED, $8000. Last instruction, SWI will break the program running by returning to the monitor program.

```
0200 86 AA              LDA #$AA
0202 B7 80 00           STA $8000
0205 3F                 SWI
```

Now press PC, the current display will show address 200. To run the code, press key GO.

What is happening at GPIO1 LED?

The display will show the address next location, 206

Check result in A register with key REG, 0.

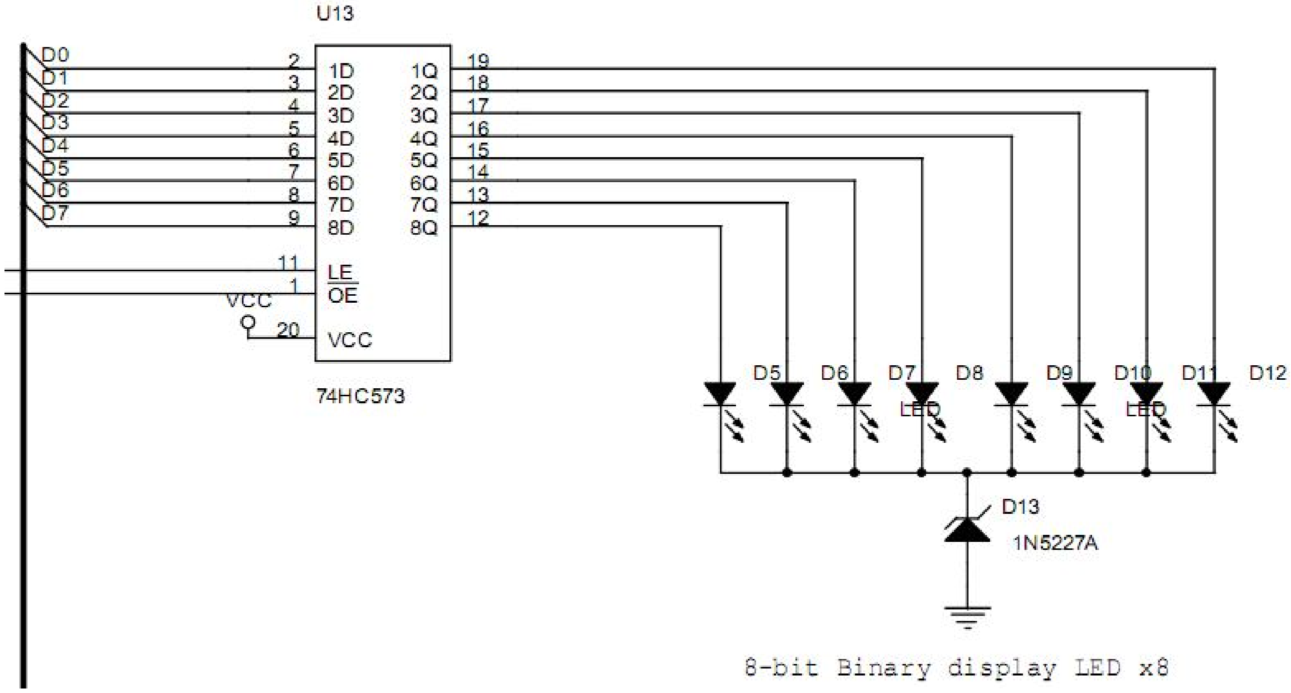
What is the value in A?

Can you change the byte being loaded from AA to another value, how?

SWI instruction is Software Interrupt. When executed, the CPU will get the locations to be called from the SWI vector located at FFFA and FFFB. All CPU registers and condition code are saved to stack memory. And will be copied to the user registers by monitor program. So we can examine them after program execution.

GPIO1 LED

The kit provides a useful 8-bit binary display. It can be used to debug the program or code running demonstration. The location is $8000. The output port is 8-bit data flip-flop. Logic 1 at the output will make LED lit.



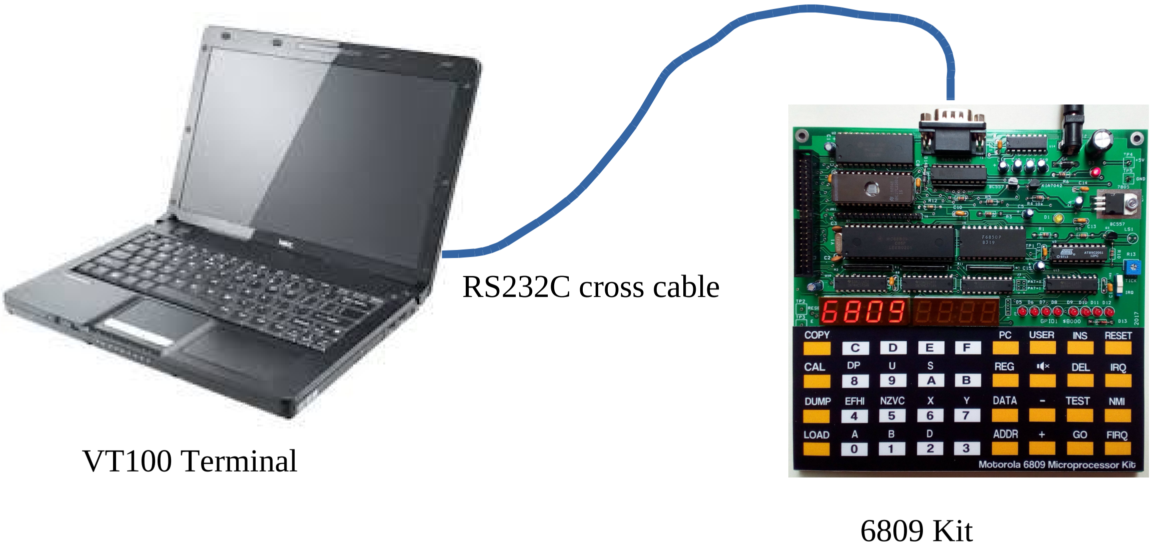
We can use instruction STA $8000, to write the content of accumulator to this location.

Bit ‘1’ will make the LED turn on and bit ‘0’ will turn off. We can check 8-bit data in binary number directly.

The hex code for STA $8000 is B7, 80, 00. Only three bytes and easy to remember.

CONNECTING 6809 KIT TO TERMINAL

We can connect the 6809 kit to a terminal by RS232C cross cable. You may download free terminal program, teraterm from this URL, http://ttssh2.sourceforge.jp/index.html.en

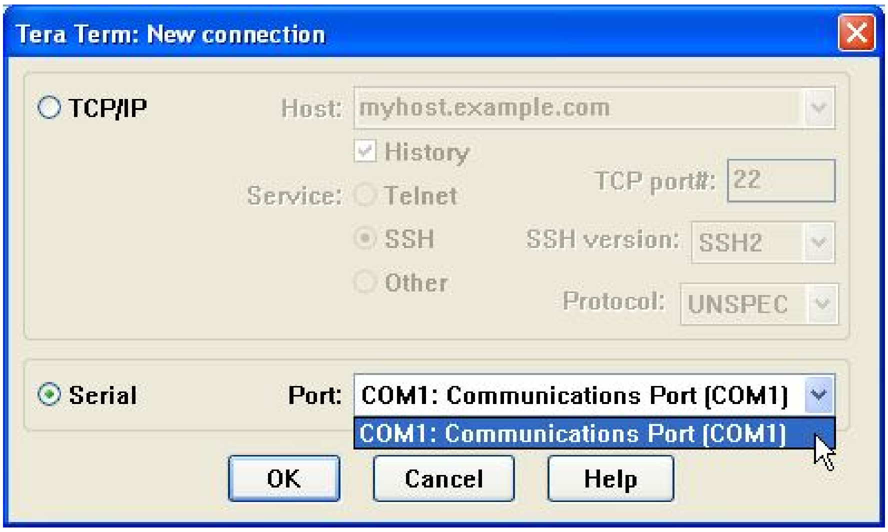

RS232C cross cable
VT100 Terminal
6809 Kit
6809
COPY C D E F PC USER INS RESET
CAL DP 8 U 9 S A B REG DEL IRQ
DUMP EFHI 4 NZVC 5 X 6 Y 7 DATA - TEST NMI
LOAD A 0 B 1 D 2 3 ADDR + GO FIRQ
Motorola 6809 Microprocessor Kit

The example shows connecting laptop with COM1 port to the RS232C port of the 6809 kit.

New laptop may not have the COM port, we can use the USB-RS232 adapter for converting the USB port to RS232 port.

To download Intel hex file that generated from the assembler or c compiler, set serial port speed to 19200 bit/s, 8-data bit, no parity, no flow control, one stop bit.

Step 1 Run teraterm, then click at Serial connection.

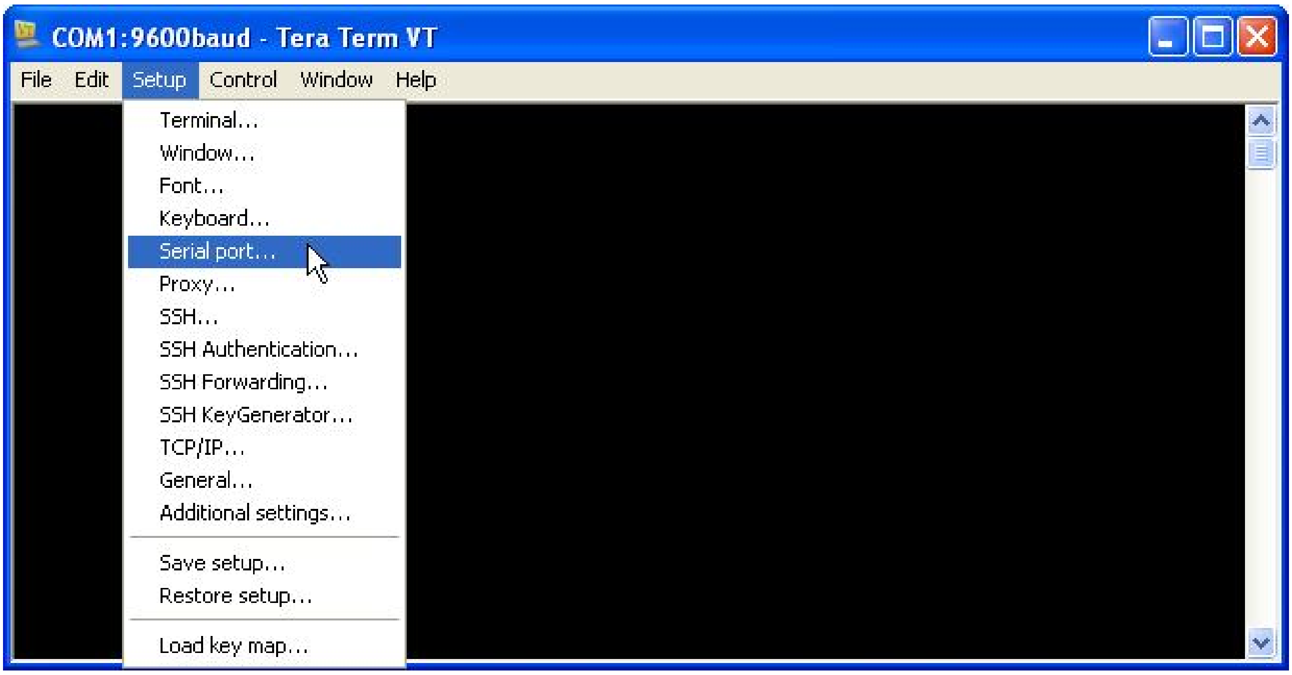


Tera Term: New connection

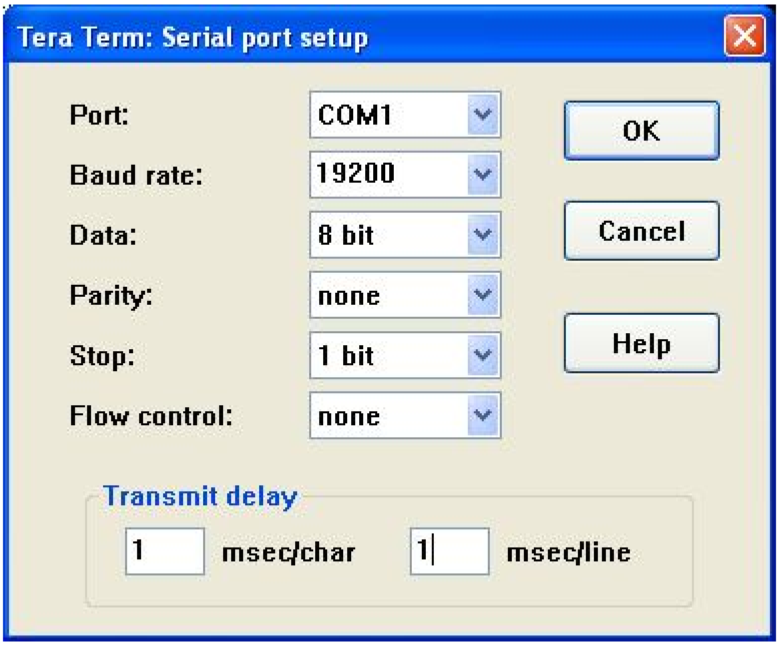
○ TCP/IP   Host: myhost.example.com
☑ History
Service: ○ Telnet   TCP port#: 22
● SSH   SSH version: SSH2
○ Other   Protocol: UNSPEC

● Serial   Port: COM1: Communications Port (COM1)
COM1: Communications Port (COM1)

Step 2 Click setup>Serial port.



Step 3 Set serial port speed to 19200 and format as shown below. **Set transmit delay 1ms for character and line.**

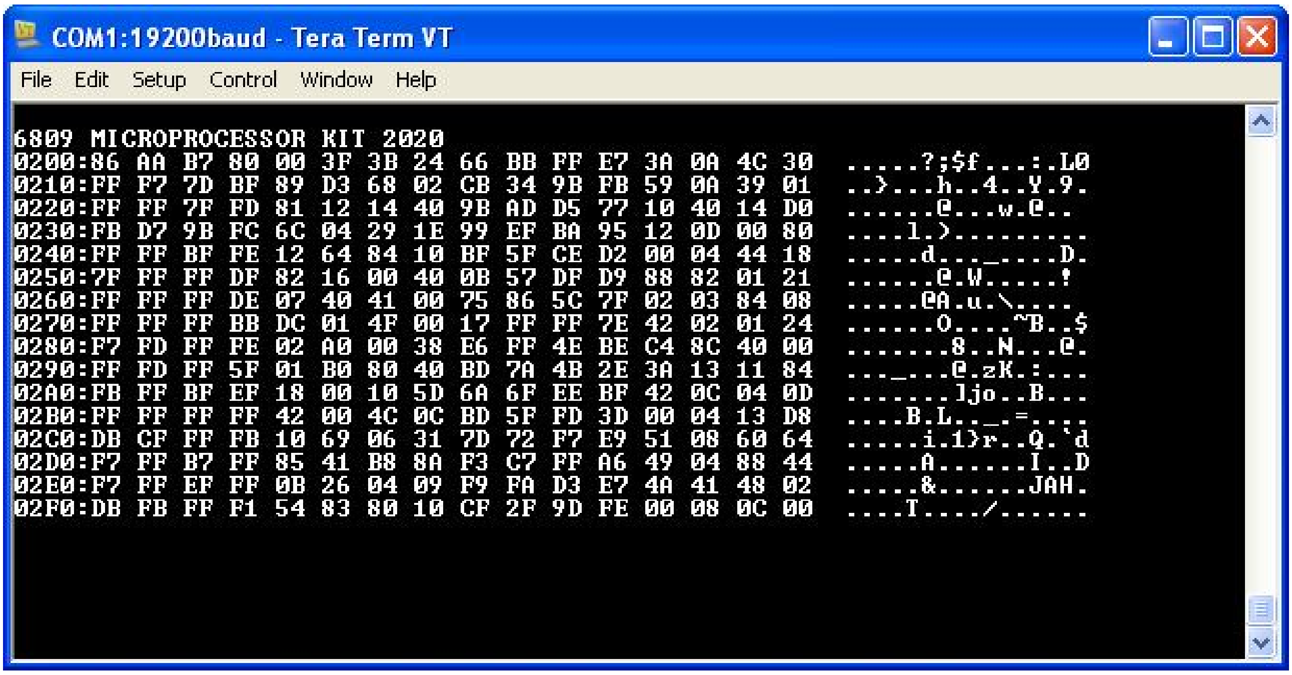


Port:	COM1
Baud rate:	19200
Data:	8 bit
Parity:	none
Stop:	1 bit
Flow control:	none

Transmit delay

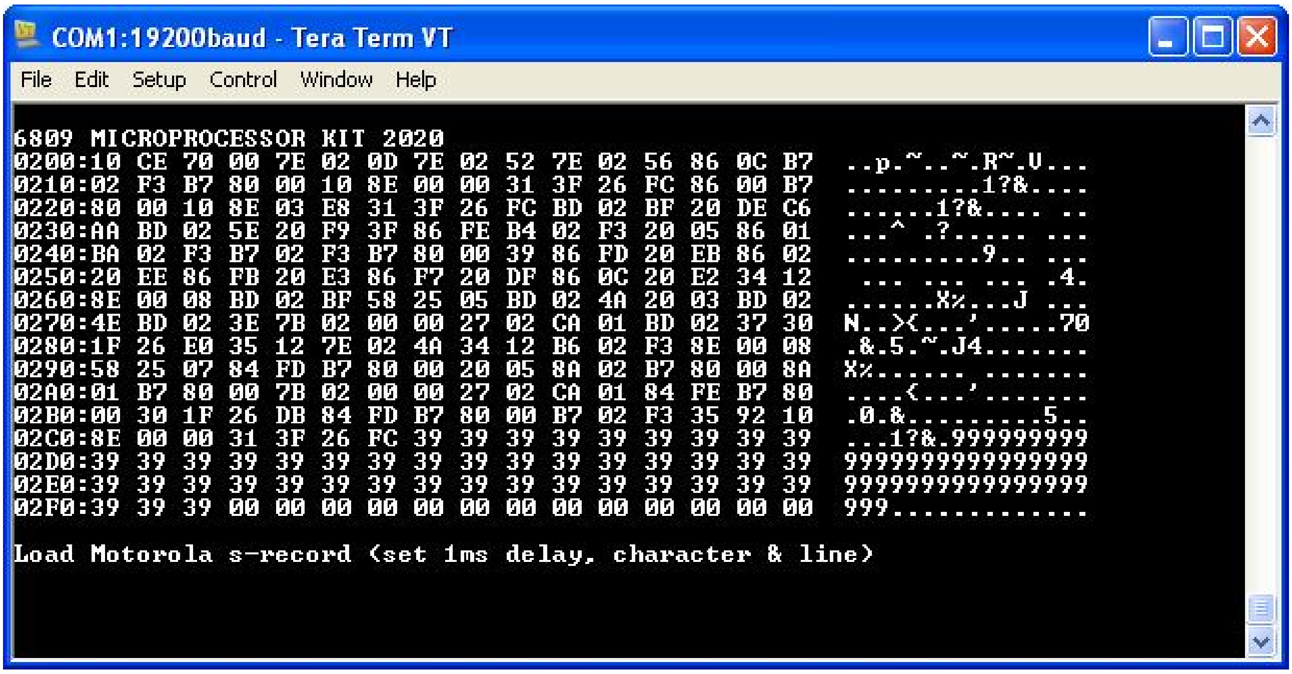
1 msec/char 1 msec/line

Step 4 Press RESET on 6809 kit. The kit will send cold message on screen. Press key DUMP, the display will show the memory dump.


COM1:19200baud - Tera Term VT
File Edit Setup Control Window Help

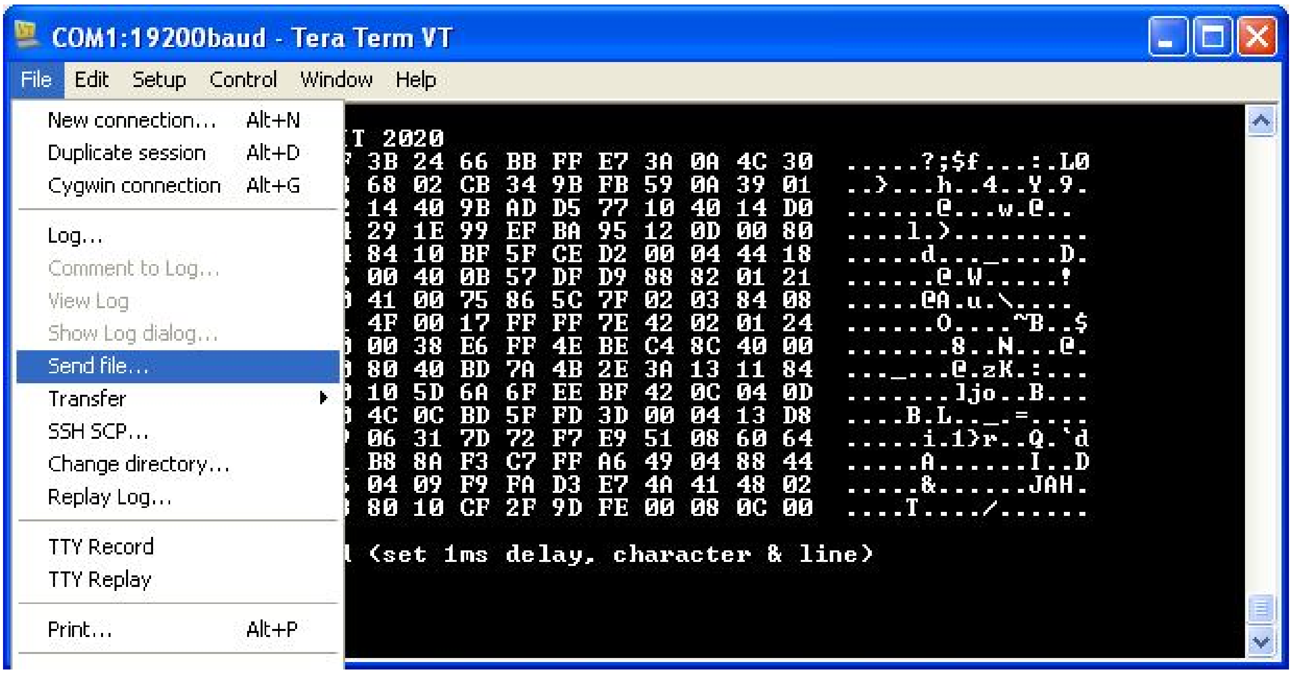
```
6809 MICROPROCESSOR KIT 2020
0200:86 AA B7 80 00 3F 3B 24 66 BB FF E7 3A 0A 4C 30  .....?;$f...:.L0
0210:FF F7 7D BF 89 D3 68 02 CB 34 9B FB 59 0A 39 01  ..}...h..4..Y.9.
0220:FF FF 7F FD 81 12 14 40 9B AD D5 77 10 40 14 D0  .......@...w.@..
0230:FB D7 9B FC 6C 04 29 1E 99 EF BA 95 12 0D 00 80  ....l.).........
0240:FF FF BF FE 12 64 84 10 BF 5F CE D2 00 04 44 18  .....d..._....D.
0250:7F FF FF DF 82 16 00 40 0B 57 DF D9 88 82 01 21  .......@.W.....!
0260:FF FF FF DE 07 40 41 00 75 86 5C 7F 02 03 84 08  .....@A.u.\.....
0270:FF FF FF BB DC 01 4F 00 17 FF FF 7E 42 02 01 24  ......O....~B..$
0280:F7 FD FF FE 02 A0 00 38 E6 FF 4E BE C4 8C 40 00  .......8..N...@.
0290:FF FD FF 5F 01 B0 80 40 BD 7A 4B 2E 3A 13 11 84  ..._...@.zK.:...
02A0:FB FF BF EF 18 00 10 5D 6A 6F EE BF 42 0C 04 0D  .......]jo..B...
02B0:FF FF FF FF 42 00 4C 0C BD 5F FD 3D 00 04 13 D8  ....B.L.._.=....
02C0:DB CF FF FB 10 69 06 31 7D 72 F7 E9 51 08 60 64  .....i.1}r..Q.`d
02D0:F7 FF B7 FF 85 41 B8 8A F3 C7 FF A6 49 04 88 44  .....A......I..D
02E0:F7 FF EF FF 0B 26 04 09 F9 FA D3 E7 4A 41 48 02  .....&......JAH.
02F0:DB FB FF F1 54 83 80 10 CF 2F 9D FE 00 08 0C 00  ....T..../......
```

Step 5 Press key LOAD, the display will show “Load Motorola s-record”


COM1:19200baud - Tera Term VT
File Edit Setup Control Window Help

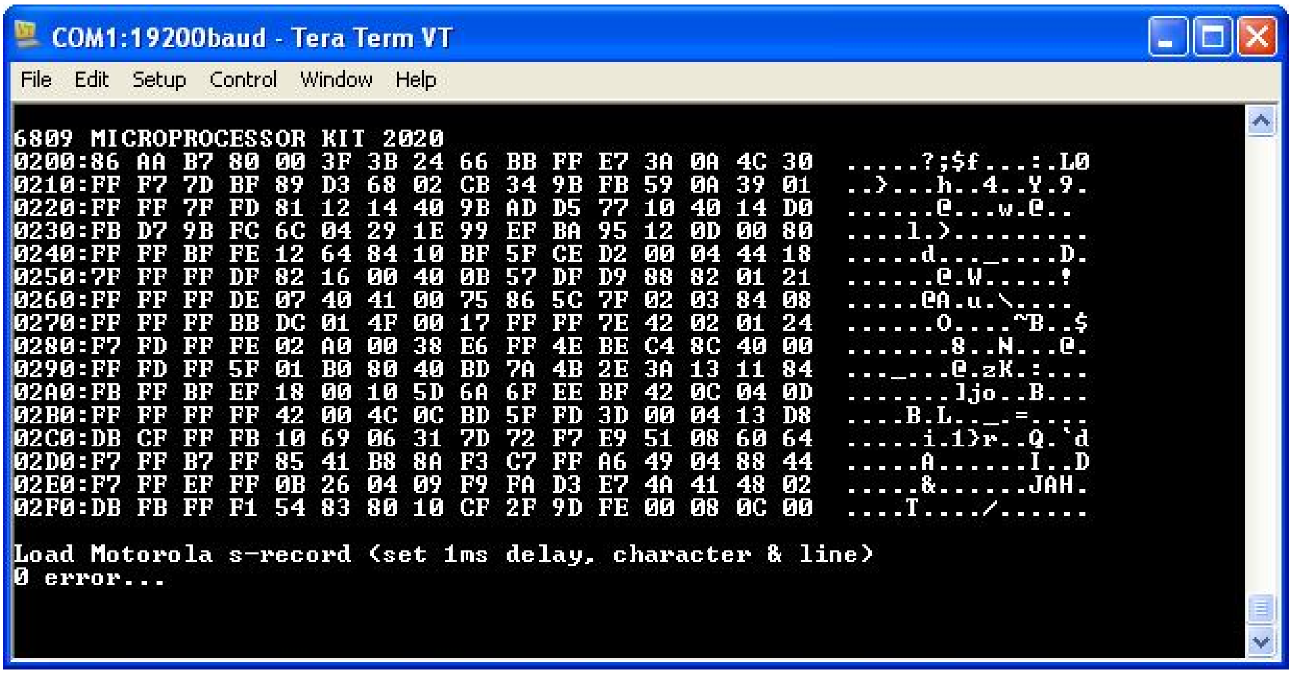
```
6809 MICROPROCESSOR KIT 2020
0200:10 CE 70 00 7E 02 0D 7E 02 52 7E 02 56 86 0C B7  ..p.~..~.R~.V...
0210:02 F3 B7 80 00 10 8E 00 00 31 3F 26 FC 86 00 B7  .........1?&....
0220:80 00 10 8E 03 E8 31 3F 26 FC BD 02 BF 20 DE C6  ......1?&.... ..
0230:AA BD 02 5E 20 F9 3F 86 FE B4 02 F3 20 05 86 01  ...^ .?..... ...
0240:BA 02 F3 B7 02 F3 B7 80 00 39 86 FD 20 EB 86 02  .........9.. ...
0250:20 EE 86 FB 20 E3 86 F7 20 DF 86 0C 20 E2 34 12   ... ... ... .4.
0260:8E 00 08 BD 02 BF 58 25 05 BD 02 4A 20 03 BD 02  ......X%...J ...
0270:4E BD 02 3E 7B 02 00 00 27 02 CA 01 BD 02 37 30  N..>{...'.....70
0280:1F 26 E0 35 12 7E 02 4A 34 12 B6 02 F3 8E 00 08  .&.5.~.J4.......
0290:58 25 07 84 FD B7 80 00 20 05 8A 02 B7 80 00 8A  X%...... .......
02A0:01 B7 80 00 7B 02 00 00 27 02 CA 01 84 FE B7 80  ....{...'.......
02B0:00 30 1F 26 DB 84 FD B7 80 00 B7 02 F3 35 92 10  .0.&.........5..
02C0:8E 00 00 31 3F 26 FC 39 39 39 39 39 39 39 39 39  ...1?&.999999999
02D0:39 39 39 39 39 39 39 39 39 39 39 39 39 39 39 39  9999999999999999
02E0:39 39 39 39 39 39 39 39 39 39 39 39 39 39 39 39  9999999999999999
02F0:39 39 39 00 00 00 00 00 00 00 00 00 00 00 00 00  999.............

Load Motorola s-record (set 1ms delay, character & line)
```

Step 6 On PC, Click file>Send File>TEST1.s19.



```
T 2020
 3B 24 66 BB FF E7 3A 0A 4C 30   .....?;$f...:.L0
 68 02 CB 34 9B FB 59 0A 39 01   ..>...h..4..Y.9.
 14 40 9B AD D5 77 10 40 14 D0   ......@...w.@..
 29 1E 99 EF BA 95 12 0D 00 80   ....l.>.........
 84 10 BF 5F CE D2 00 04 44 18   .....d..._....D.
 00 40 0B 57 DF D9 88 82 01 21   ......@.W.....!
 41 00 75 86 5C 7F 02 03 84 08   .....@A.u.\....
 4F 00 17 FF FF 7E 42 02 01 24   ......O....~B..$
 00 38 E6 FF 4E BE C4 8C 40 00   .......8..N...@.
 80 40 BD 7A 4B 2E 3A 13 11 84   ..._...@.zK.:...
 10 5D 6A 6F EE BF 42 0C 04 0D   ........ljo..B...
 4C 0C BD 5F FD 3D 00 04 13 D8   ....B.L.._.=....
 06 31 7D 72 F7 E9 51 08 60 64   .....i.1}r..Q.`d
 B8 8A F3 C7 FF A6 49 04 88 44   .....A.......I..D
 04 09 F9 FA D3 E7 4A 41 48 02   .....&.......JAH.
 80 10 CF 2F 9D FE 00 08 0C 00   ....T..../......

 (set 1ms delay, character & line)
```

The kit will read the hex file, write to memory, when completed if no checksum error, the display will show 0 error.

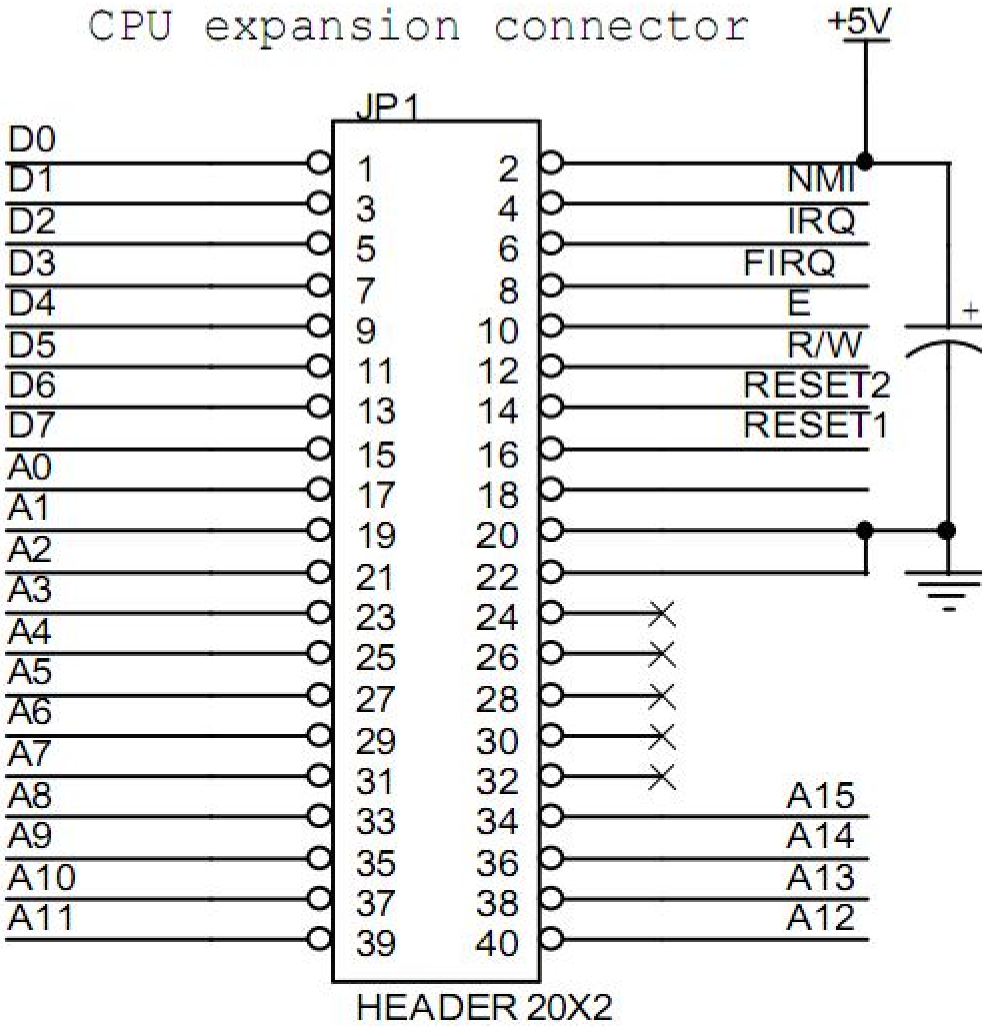


```
6809 MICROPROCESSOR KIT 2020
0200:86 AA B7 80 00 3F 3B 24 66 BB FF E7 3A 0A 4C 30  .....?;$f...:.L0
0210:FF F7 7D BF 89 D3 68 02 CB 34 9B FB 59 0A 39 01  ..>...h..4..Y.9.
0220:FF FF 7F FD 81 12 14 40 9B AD D5 77 10 40 14 D0  .......@...w.@..
0230:FB D7 9B FC 6C 04 29 1E 99 EF BA 95 12 0D 00 80  ....l.>.........
0240:FF FF BF FE 12 64 84 10 BF 5F CE D2 00 04 44 18  .....d..._....D.
0250:7F FF FF DF 82 16 00 40 0B 57 DF D9 88 82 01 21  .......@.W.....!
0260:FF FF FF DE 07 40 41 00 75 86 5C 7F 02 03 84 08  .....@A.u.\.....
0270:FF FF FF BB DC 01 4F 00 17 FF FF 7E 42 02 01 24  .......O....~B..$
0280:F7 FD FF FE 02 A0 00 38 E6 FF 4E BE C4 8C 40 00  .......8..N...@.
0290:FF FD FF 5F 01 B0 80 40 BD 7A 4B 2E 3A 13 11 84  ..._...@.zK.:...
02A0:FB FF BF EF 18 00 10 5D 6A 6F EE BF 42 0C 04 0D  .......]jo..B...
02B0:FF FF FF FF 42 00 4C 0C BD 5F FD 3D 00 04 13 D8  ....B.L.._.=....
02C0:DB CF FF FB 10 69 06 31 7D 72 F7 E9 51 08 60 64  .....i.1}r..Q.`d
02D0:F7 FF B7 FF 85 41 B8 8A F3 C7 FF A6 49 04 88 44  .....A......I..D
02E0:F7 FF EF FF 0B 26 04 09 F9 FA D3 E7 4A 41 48 02  .....&......JAH.
02F0:DB FB FF F1 54 83 80 10 CF 2F 9D FE 00 08 0C 00  ....T..../......

Load Motorola s-record (set 1ms delay, character & line)
0 error...
```

Press RESET then, PC to set memory address 200, the press key GO to run the program.

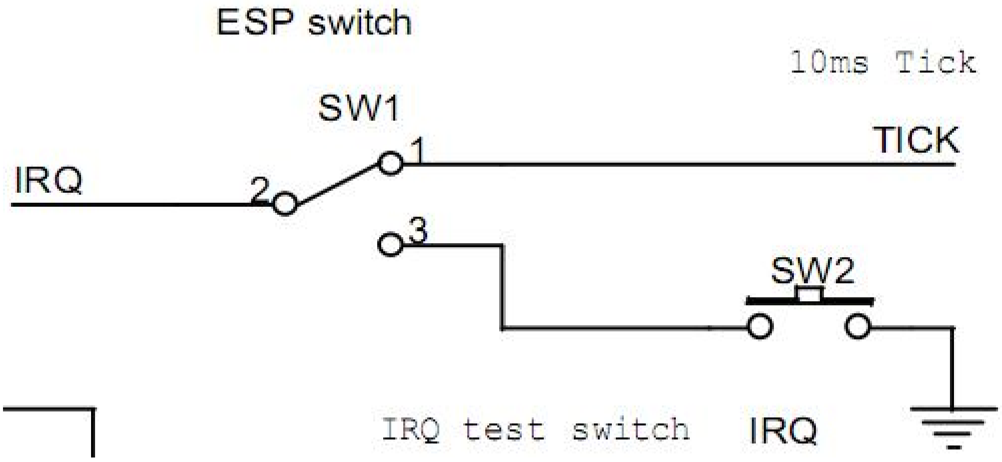
EXPANSION BUS HEADER

JP1, 40-pin header provides CPU bus signals for expansion or I/O interfacing. Students may learn how to make the simple I/O port, interfacing to Analog-to-Digital Converter, experimenting with interrupt process with FIRQ, IRQ and NMI.

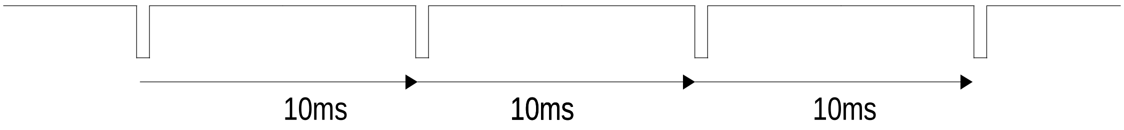


10ms TICK GENERATOR

SW1 is a selector for interrupt source between key IRQ or 10ms tick produced by 89C2051 microcontroller. Tick generator is software controlled using timer0 interrupt in the 89C2051 chip. The active low tick signal is sent to P3.7. For tick running indicator, P1.7 drives D1 LED.



Tick is a 10ms periodic signal for triggering the 6809 IRQ pin. When select SW1 to Tick, the 6809 CPU can be triggered by the external interrupt. The 100Hz tick or 10ms tick can be used to produce tasks that executes with multiple of tick.



USING SYSTEM TICK

The monitor program provides 10ms system tick when IRQ is enabled and SW1 is set to 10ms position. The monitor program uses IRQ interrupt for producing 10ms time base.

System tick is one byte memory located at address $700E in RAM. When IRQ is enabled, SW1 is set to 10ms, this memory location will be incremented by one every 10ms or 100Hz rate.

We can simply examine this variable by polling method. With 100Hz rate, if the Tick variable becomes 100, time will be 1000ms or one second exactly.

Below is the list of example program how to use 10ms system tick.

```
              *  RUNNING CODE USING 10ms TICK

700E             TICK     EQU $700E

0200                      ORG $200

0200 86 00       MAIN     LDA #0
0202 1F 8B                TFR A,DP     SET PAGE 0

0204 3C EF                CWAI #%11101111 ENABLE IRQ

0206 B6 70 0E    LOOP     LDA TICK
0209 81 64                CMPA #100
020B 26 0A                BNE SKIP
020D 7F 70 0E             CLR TICK

0210 0C 00                INC 0
0212 96 00                LDA 0
0214 B7 80 00             STA $8000

0217 20 ED        SKIP    BRA LOOP

                          END
```

Program starts with setting DP register to 0 for page zero accessing. Then the IRQ was enabled.

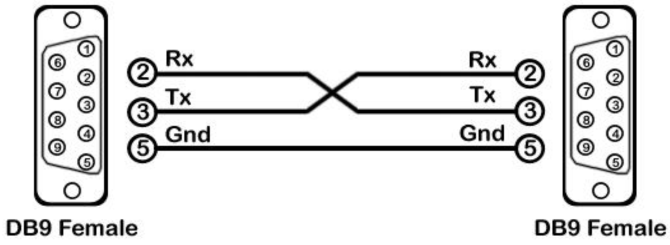
Main loop will poll the variable TICK and compare it, until reaches 100, then clear TICK to 0. The byte 0 in the page zero will be incremented, then write it to location $8000.

Try enter the hex code from address 200 to 218.

What is happening at the gpio1 LED? Can you change the counting rate? How?

RS232C PORT

The RS232C port is for serial communication. We can use a cross cable or null MODEM cable to connect between the kit and terminal. The connector for both sides are DB9 female. We may build it or buying from computer stores.

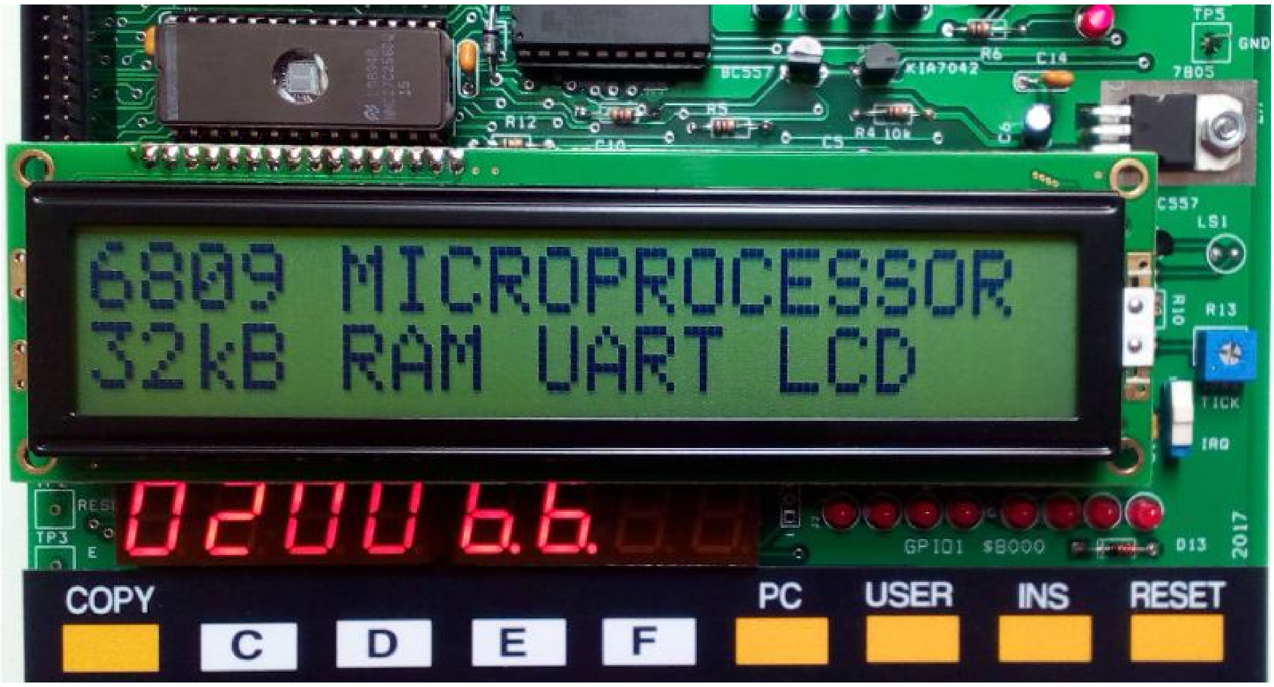


For new PC or laptop computer that have only USB port, we may use the USB to RS232 converter.

The example is CH340 USB 2.0 to RS232 COM Port Serial PDA 9 pin DB9 Wire Cable Adapter. Before we can use it, the hardware driver must be installed. Windows will assign the COM port number. On the terminal software, we can choose that port then.

CONNECTING LCD MODULE

JR1 is 16-pin header for connecting the LCD module. The example shows connecting the 20x2 line text LCD module. R12 is a current limit resistor for the back-light. R13 is trimmer POT for contrast adjustment. The LCD module is interfaced to the 6809 bus directly. The command and data registers are located in memory space having address from $9000 to $9003.



Important note: insert or remove the LCD module must be done when the kit is powered off. Ensure pin position, left hand is pin 1.

ON power up, the welcome message will be printed automatically.

Any text LCD with HD44780 compatible controller chip can be used.

Test program for the LCD display.

We will call the subroutines that setup the LCD and print string. The locations of these subroutines are shown the monitor program assembly code listing.

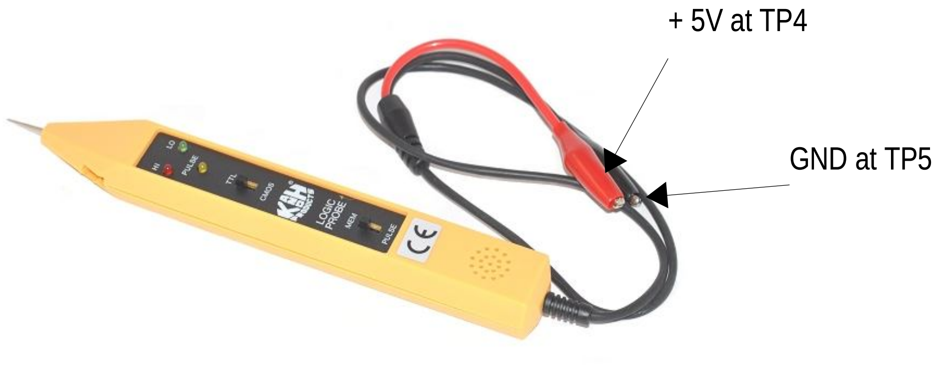
```
                        *  CALLING MONITOR C FUNCTION
                        *  DISPLAY TEXT ON LCD

0200                       ORG $200

C228            INIT_LCD  EQU $C228
C26B            PSTRING   EQU $C26B

0200 BD C2 28     MAIN    JSR INIT_LCD

0203 CC 02 0E             LDD #TEXT1
0206 34 06                PSHS D

0208 BD C2 6B             JSR PSTRING

020B 32 62                LEAS 2,S
020D 3F                   SWI

020E 48 65 6C 6C 6F 20  TEXT1   FCC "Hello from 6809"
     66 72 6F 6D 20 36
     38 30 39
021D 00                         FCB 0

                           END
```

Try enter the hex code from address 200 to 21D. When completed, press PC then GO.

What is happening? Can you change the message? How?

LOGIC PROBE POWER SUPPLY

The kit provides test points TP4(+5V) and TP5(GND) for using the logic probe. Students may learn digital logic signals with logic probe easily. Tick signal is indicated by D1 LED blinking. Red clip is for +5V and Black clip for GND.



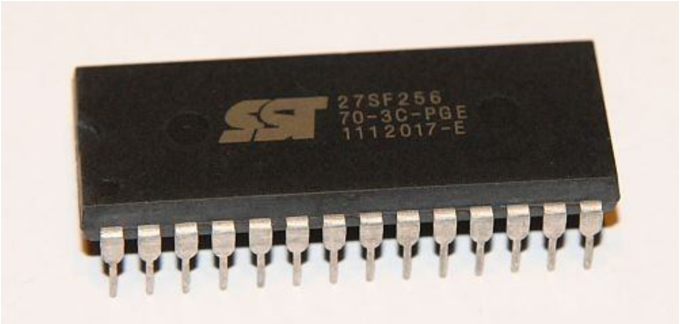
CUSTOMIZING THE MONITOR PROGRAM

The latest monitor source code is available for download. This section explains how to modify the monitor program, compiling and programming the new flash EPROM.

Tool and parts:

1. MiniPRO Eprom programmer.

2. Flash EPROM, 27SF256, and 28 pin socket. (The 28 pin socket will make stronger the EPROM pins)



Steps for customizing the monitor program.

1. Download the source code and compiler tools from

http://www.kswichit.com/6809/6809.htm

2. Edit the source code.

3. Compile the source code.

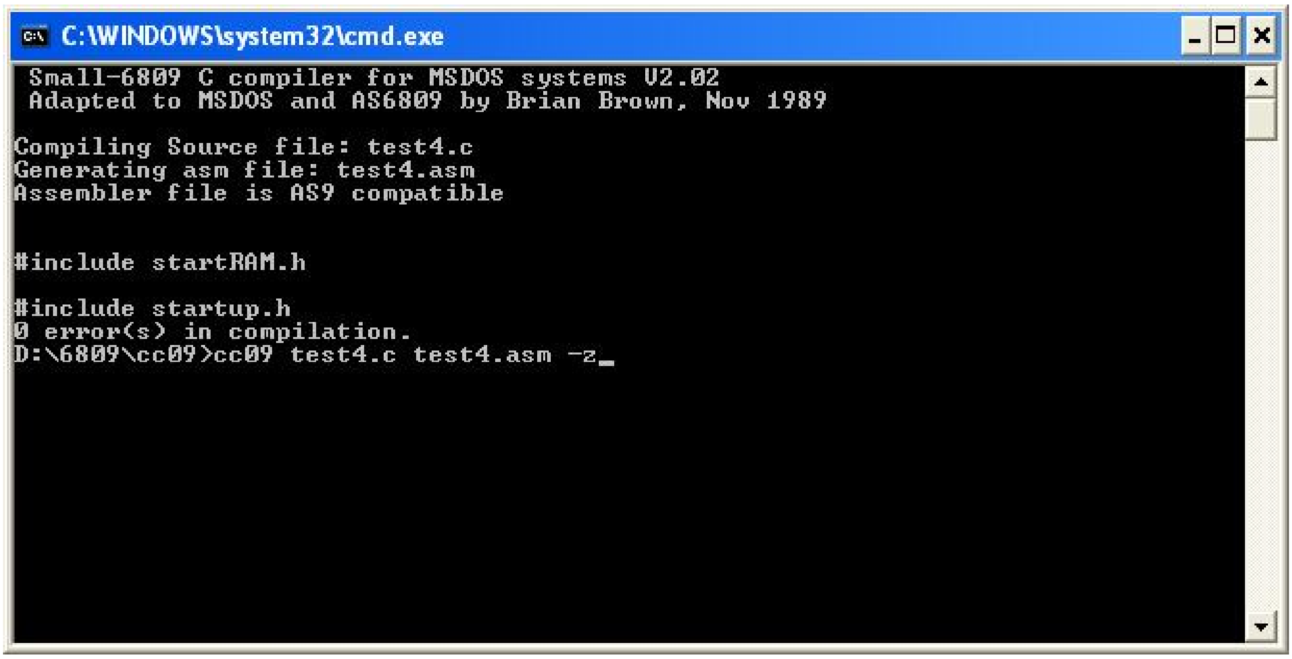
4. Modify the object file from 64kB to 32kB.

5. Program the object file to the new EPROM.

6. Repeat step 2 if needed.

The compiler is cc09, the small-6809 c compiler V2.02.

Compiling the source code with cc09.



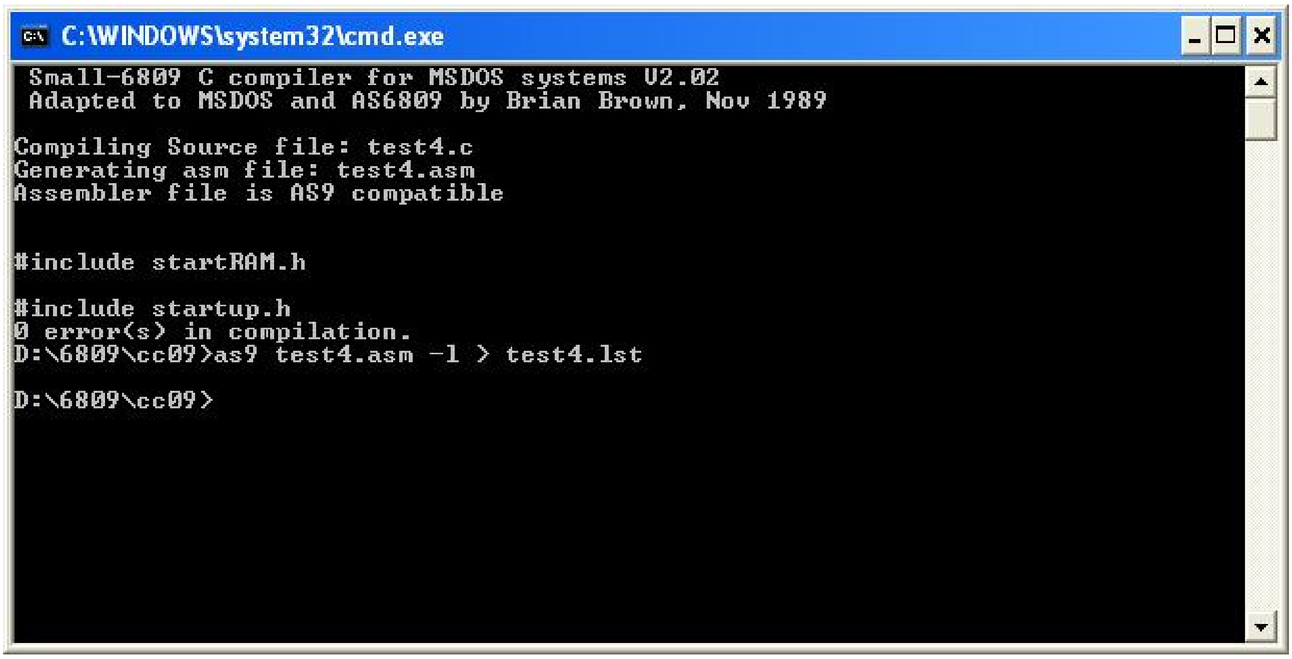
```
 Small-6809 C compiler for MSDOS systems V2.02
 Adapted to MSDOS and AS6809 by Brian Brown, Nov 1989

Compiling Source file: test4.c
Generating asm file: test4.asm
Assembler file is AS9 compatible


#include startRAM.h

#include startup.h
0 error(s) in compilation.
D:\6809\cc09>cc09 test4.c test4.asm -z_
```

Under dos command line,

D:\6809\cc09>cc09 test4.c test4.asm -z

After compiling, the output file will be test4.asm

We will use AS9 to compile the test4.asm into the Motorola s-record.



```
 Small-6809 C compiler for MSDOS systems V2.02
 Adapted to MSDOS and AS6809 by Brian Brown, Nov 1989

Compiling Source file: test4.c
Generating asm file: test4.asm
Assembler file is AS9 compatible


#include startRAM.h

#include startup.h
0 error(s) in compilation.
D:\6809\cc09>as9 test4.asm -l > test4.lst

D:\6809\cc09>
```

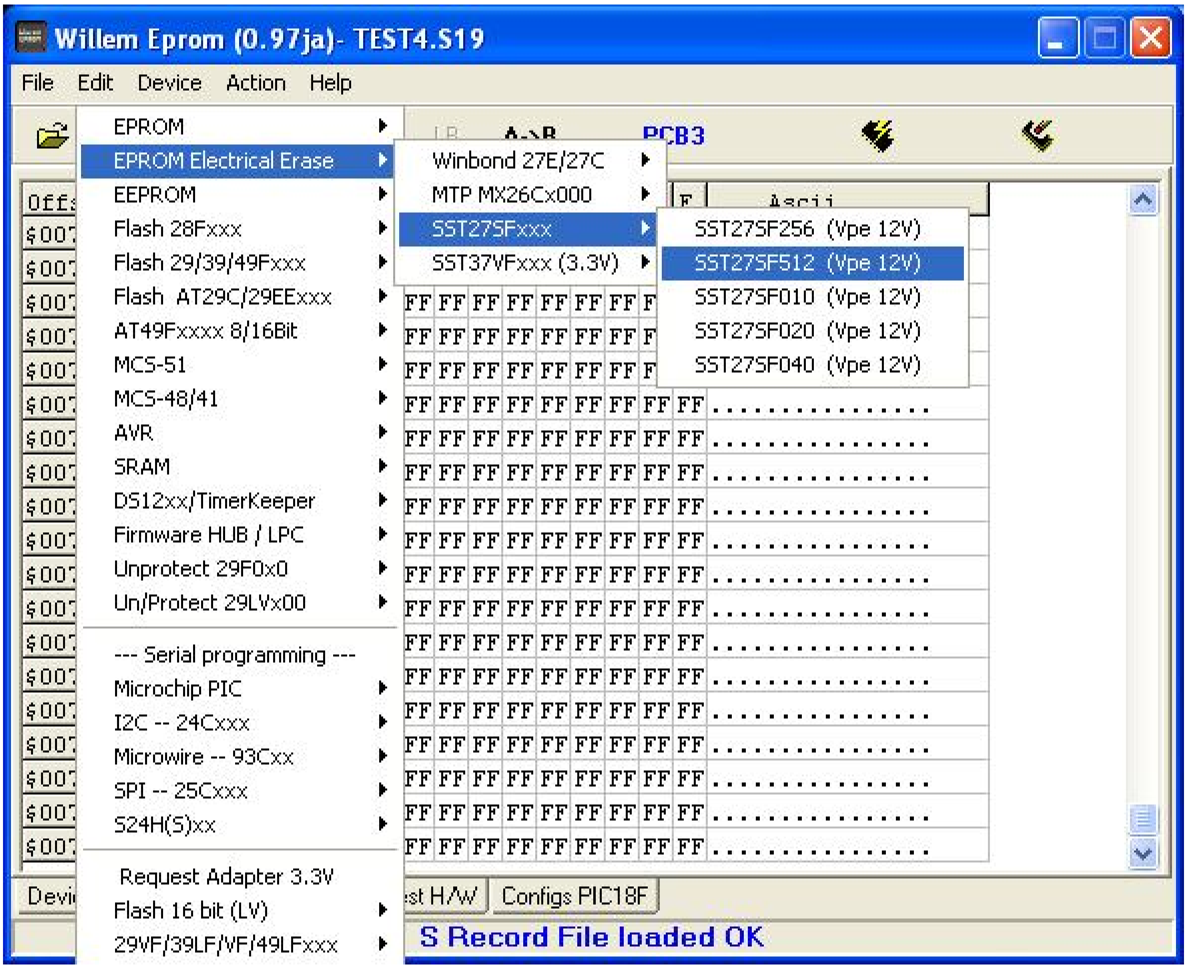
The optional -l will generate the List file.

We will get TEST4.s19, 64kB space from $0000 to $FFFF.

To program the 32kB EPROM, we must move the 32kB upper block to the lower block.

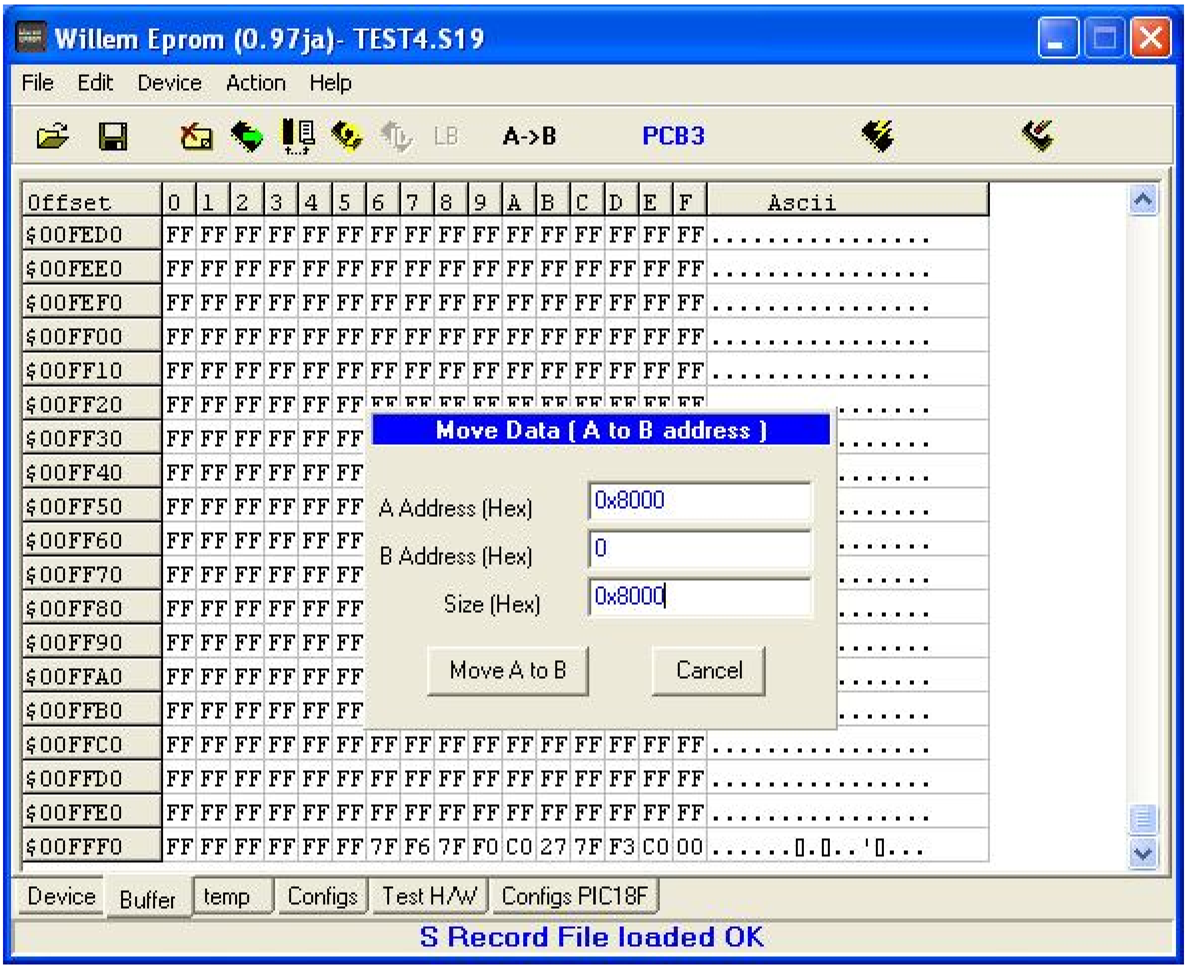
We can use Willem programmer to help modify the object file.

Since the object file is fit for 64kB, so we select the SST27SF512 device.



Then LOAD the Motorola s-record, TEST4.s19.

Select tool, A→B, copy the upper 32kB block to lower block.



```
Offset   0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F     Ascii
$00FED0  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FEE0  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FEF0  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FF00  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FF10  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FF20  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FF30  FF FF FF FF FF FF                                       .......
$00FF40  FF FF FF FF FF FF                                       .......
$00FF50  FF FF FF FF FF FF                                       .......
$00FF60  FF FF FF FF FF FF                                       .......
$00FF70  FF FF FF FF FF FF                                       .......
$00FF80  FF FF FF FF FF FF                                       .......
$00FF90  FF FF FF FF FF FF                                       .......
$00FFA0  FF FF FF FF FF FF                                       .......
$00FFB0  FF FF FF FF FF FF                                       .......
$00FFC0  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FFD0  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FFE0  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ................
$00FFF0  FF FF FF FF FF FF 7F F6 7F F0 C0 27 7F F3 C0 00 ......▯.▯..'▯...
```

Move Data (A to B address)

A Address (Hex) 0x8000

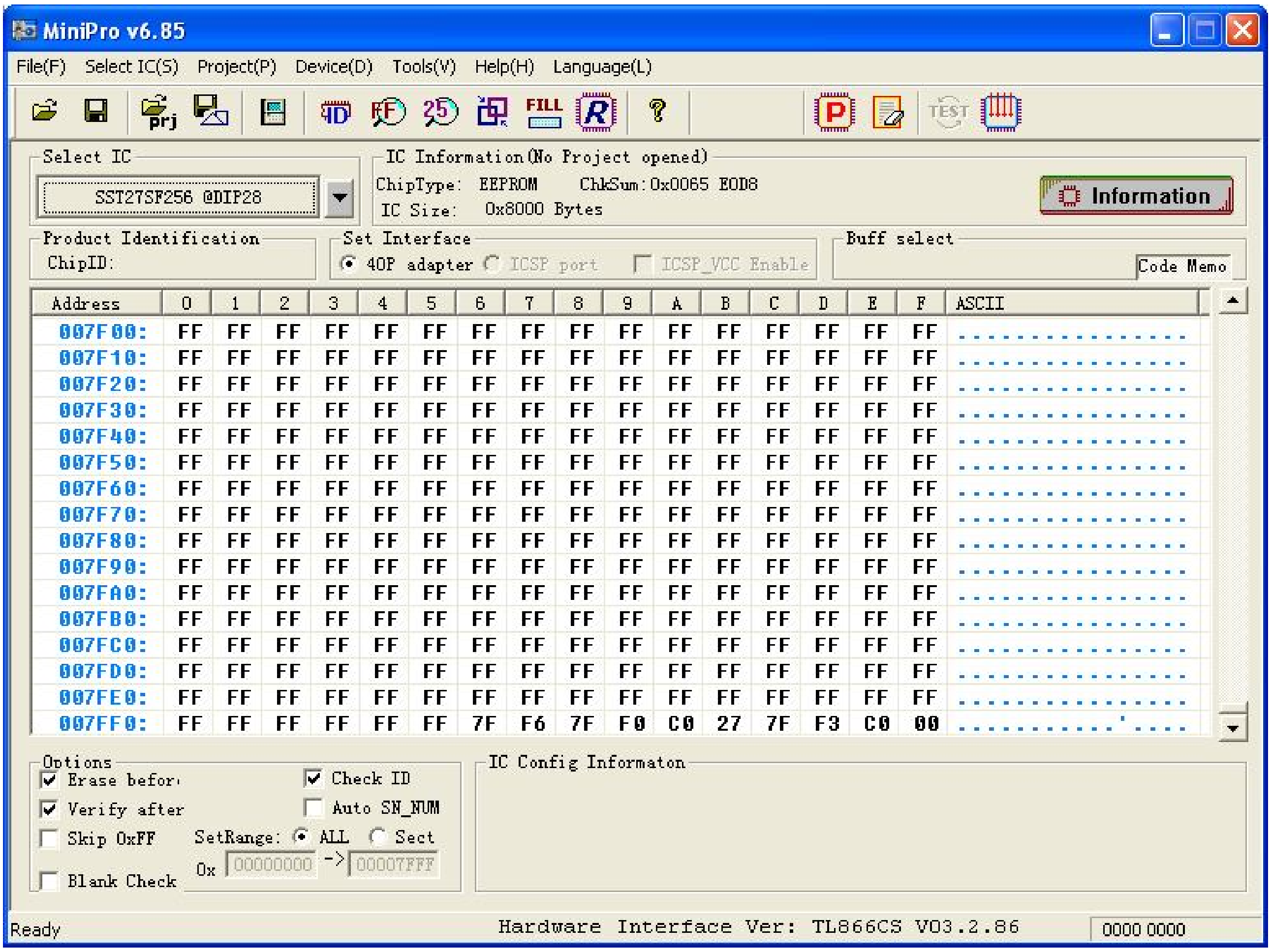
B Address (Hex) 0

Size (Hex) 0x8000

S Record File loaded OK

Then save the hex file as Intel hex file.

Then load the Intel hex file, and use MiniPro to program the flash EPROM, SST27SF256.



MiniPro v6.85
File(F) Select IC(S) Project(P) Device(D) Tools(V) Help(H) Language(L)
Information

Select IC: SST27SF256 @DIP28

IC Information(No Project opened)
ChipType: EEPROM ChkSum: 0x0065 E0D8
IC Size: 0x8000 Bytes

Product Identification
ChipID:

Set Interface: ● 40P adapter ○ ICSP port □ ICSP_VCC Enable

Buff select: Code Memo

```
Address   0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F  ASCII
007F00:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F10:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F20:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F30:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F40:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F50:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F60:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F70:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F80:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007F90:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007FA0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007FB0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007FC0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007FD0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007FE0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ................
007FF0:  FF FF FF FF FF FF 7F F6 7F F0 C0 27 7F F3 C0 00  ...........'....
```

Options
☑ Erase befor
☑ Verify after
□ Skip 0xFF
□ Blank Check
☑ Check ID
□ Auto SN_NUM
SetRange: ● ALL ○ Sect
0x 00000000 -> 00007FFF

IC Config Informaton

Ready Hardware Interface Ver: TL866CS V03.2.86 0000 0000

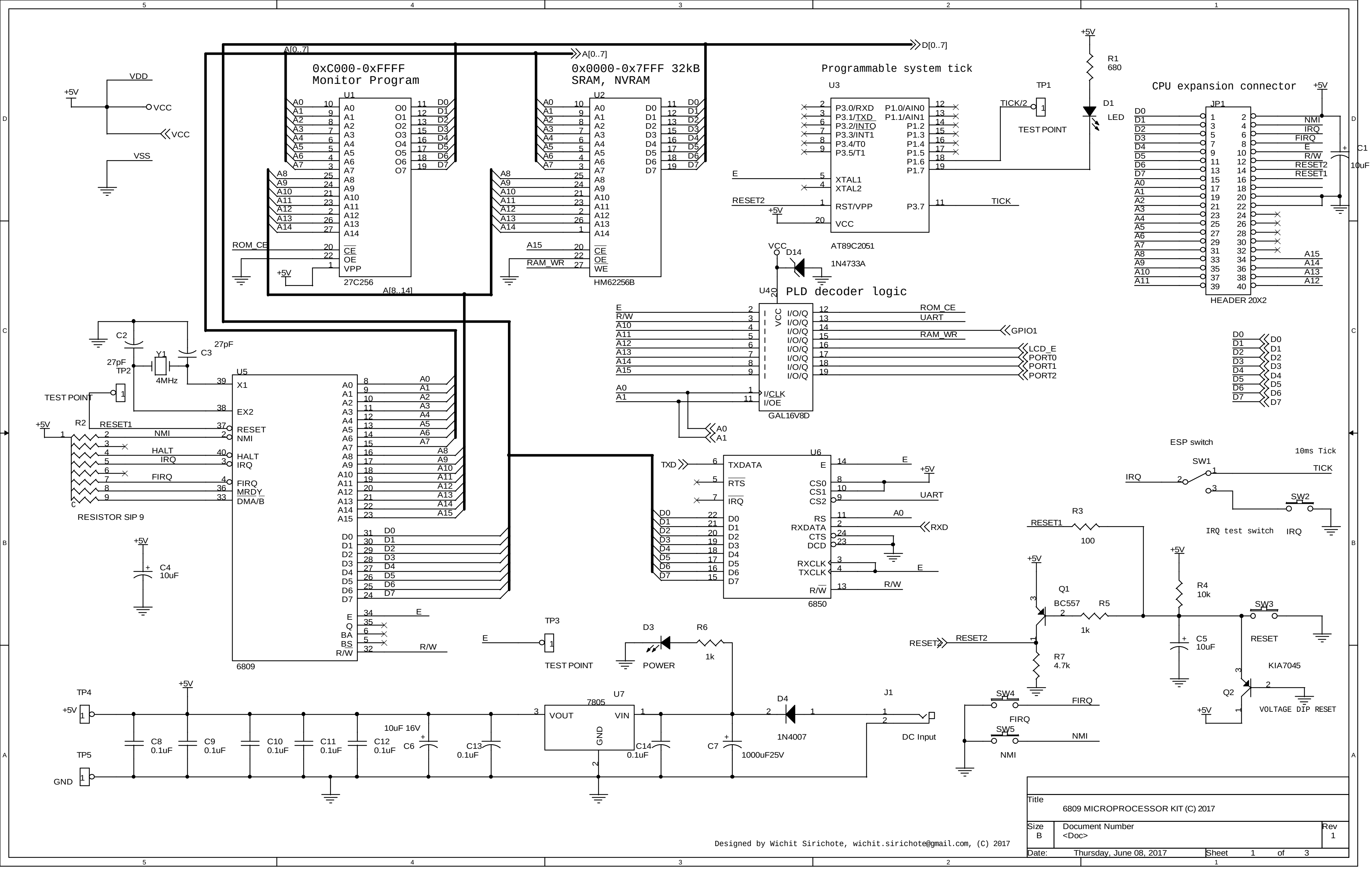
We can see the interrupt vectors for FIRQ, IRQ, SWI and RESTART C000 at FFFE.

Ensure the kit has no power, then replace the monitor ROM with the new one.

Power up and see the new function.

The flash EPROM is electrically erasable, when program it, the chip will be erased using high voltage then will be programmed with the new hex file automatically.

HARDWARE SCHEMATIC, PARTS LIST

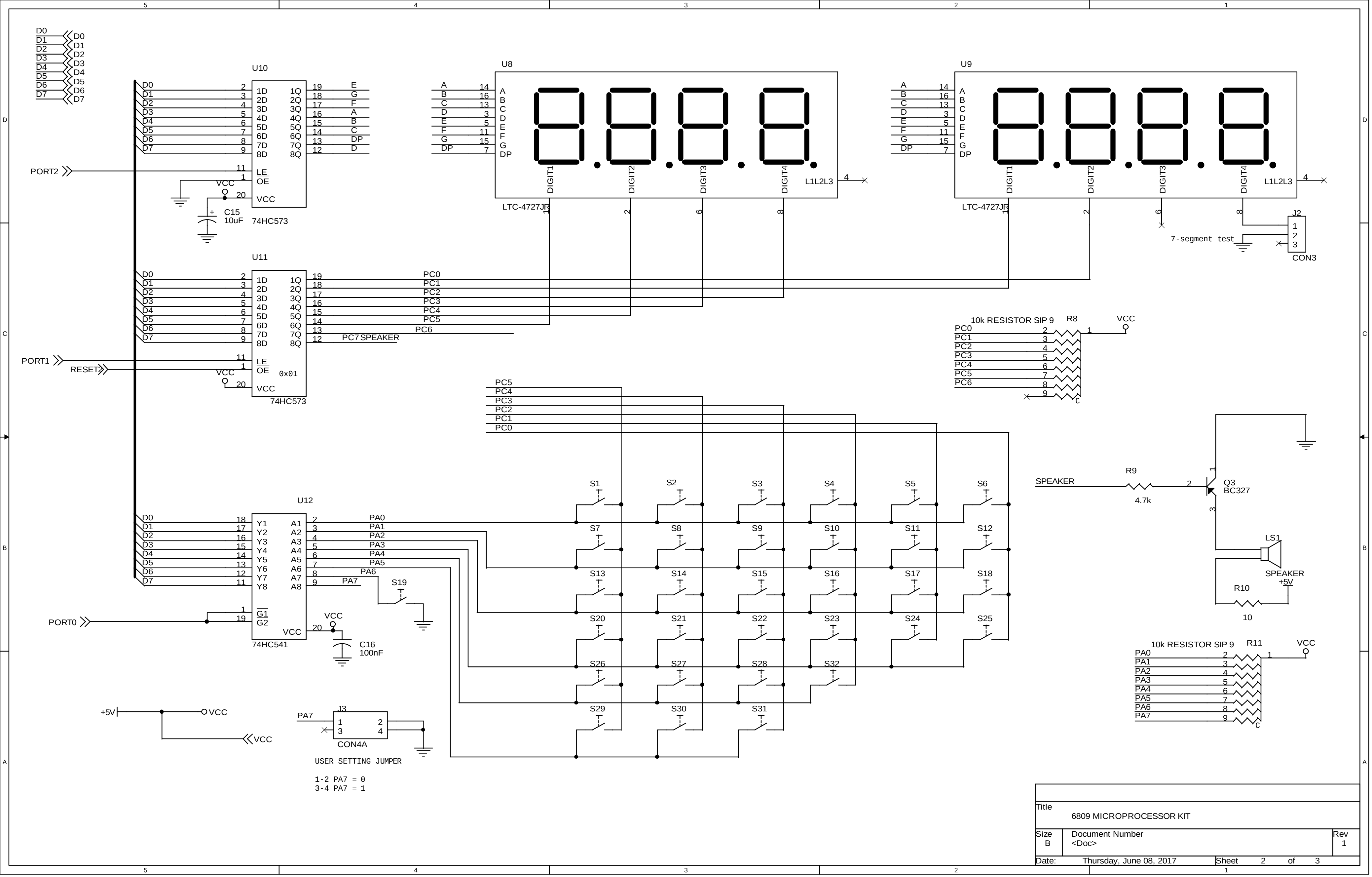


Designed by Wichit Sirichote, wichit.sirichote@gmail.com, (C) 2017

Title: 6809 MICROPROCESSOR KIT (C) 2017

Size	Document Number	Rev
B	<Doc>	1

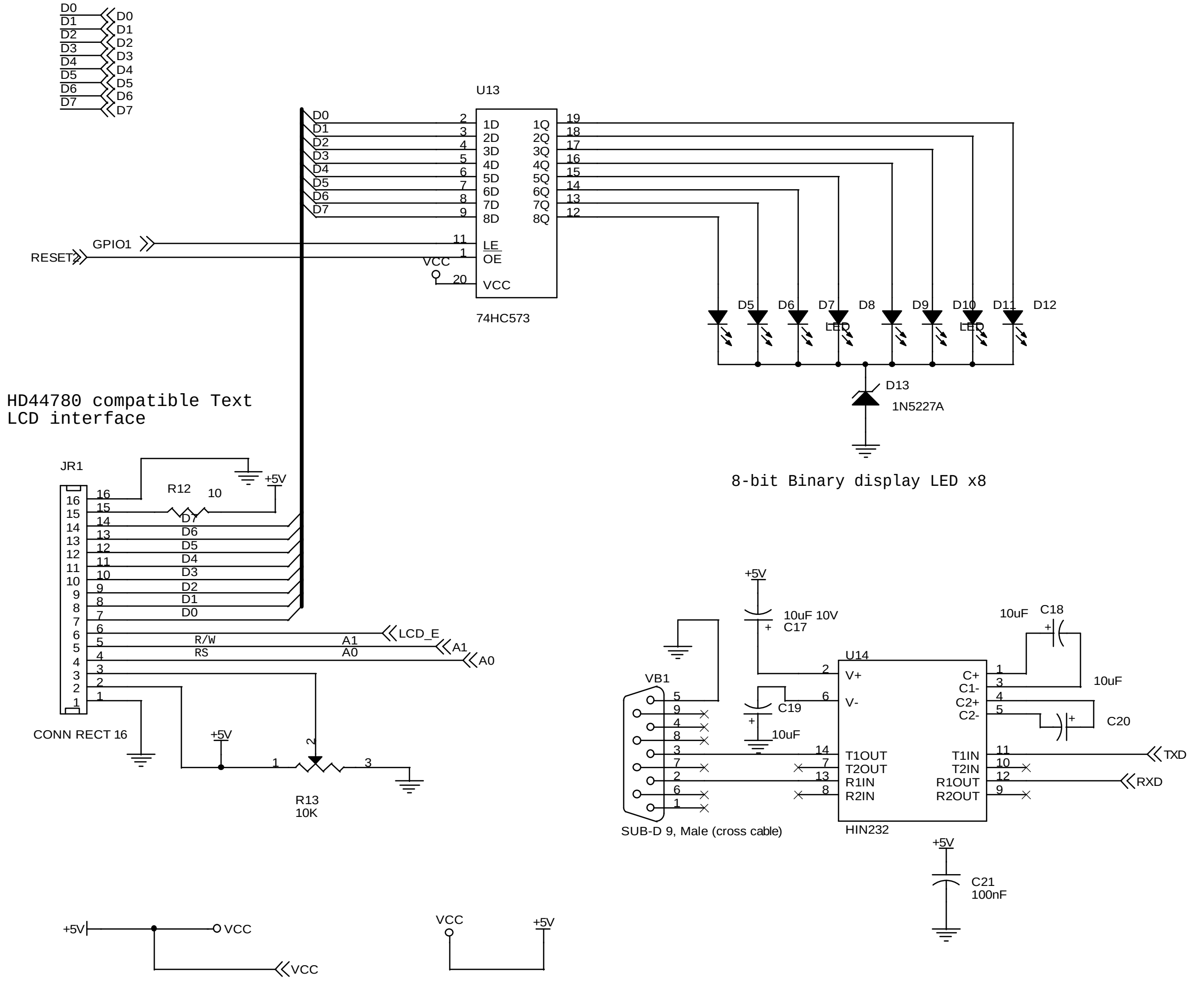
Date: Thursday, June 08, 2017 Sheet 1 of 3



Title
6809 MICROPROCESSOR KIT

Size B Document Number <Doc> Rev 1

Date: Thursday, June 08, 2017 Sheet 2 of 3



Title	6809 MICROPROCESSOR KIT	
Size B	Document Number <Doc>	Rev 1
Date:	Thursday, June 08, 2017	Sheet 3 of 3

PARTS LIST

Semiconductors

U1 27C256, 32kB Eprom
U2 HM62256B, 32kB SRAM
U3 AT89C2051, 8-bit microcontroller
U4 GAL16V8D, PLD
U5 Motorola 68B09, 8-bit microprocessor
U6 Motorola 6850, ACIA chip
U7 7805, voltage regulator
U9,U8 LTC-4727, 7-segment display
U10,U11,U13 74HC573
U12 74HC541
U14 HIN232, RS232 converter
Q1 BC557, PNP transistor
Q2 KIA7042, voltage detector
Q3 BC557 D4 1N4007
D13 1N5227A
D14 1N4733A
D1,D5,D6,D7,D8,D9,D10, LED
D11,D12
D3 3mm POWER LED

Resistors (all resistors are 1/8W +/-5%)

R1 680
R2 RESISTOR SIP 9
R3 100
R13,R4 10k
R6,R5 1k
R9,R7 4.7k
R11,R8 10k RESISTOR SIP 9
R12,R10 5, 20

Capacitors

C1 10uF electrolytic capacitor
C1,C4,C5,C15,C18,C19,C20 10uF
C3,C2 27pF
C6 10uF 16V
C7 1000uF 25V
C8,C9,C10,C11,C12 0.1uF
C13,C14 0.1uF
C21,C16 100nF
C17 10uF 16V

Additional parts

JP1 BLOCK HEADER 20X2
JR1 LCD CONN RECT 16
J1 DC Input
J2 CON3
J3 CON4A
LS1 SPEAKER
SW1 ESP switch
SW2 IRQ
SW3 RESET
SW4 FIRQ
SW5 NMI
S1,S2,S3,S4,S5,S6,S7,S8, SW PUSHBUTTON
S9,S10,S11,S12,S13,S14,
S15,S16,S17,S18,S19,S20,
S21,S22,S23,S24,S25,S26,
S27,S28,S29,S30,S31,S32
VB1 SUB-D 9, Male (cross cable)
Y1 4.9152MHz XTAL
PCB double side plate through hole
LED color filter
Keyboard sticker printable SVG file

MONITOR PROGRAM LISTINGS

```

/*

  monitor source code for 6809 MICROPROCRSSOR KIT 2020
  compiled with cc09 c compiler and as9 assembler
  monitor source code was written by Wichit Sirichote, wichit.sirichote@gm

  cc09>cc09 file.c file.asm -z
  cc09>as9 file.asm -l > file.lst

  The object file is Motorola S19 record

  more update and technical information, kswichit.com/6809/6809.htm

*/


#include startRAM.h

int i;
int j;
char n;
char k;
char u,q,o,key;
char x;
char hit, positive;
char flag;
char tick;
int bcc;
int save_bcc, bcc_error;


int temp,temp16;

int PC, save_PC;
int num, start, end, desti;

int t;

char state;

int USER_PC,USER_U,USER_X,SAVE_SP;
int USER_Y;

char USER_A,USER_B,USER_P,USER_DP;

int timeout;
char buffer[6];

char *gpio1;
char *port2;
char *port1;
char *port0;
char *dptr;
char *dptr2;

```

```c

#define  AS9 1
#include startup.h

#define ACIAPORT  0xA000

#define LCD_cwr 0x9000
#define LCD_dwr 0x9001
#define LCD_crd 0x9002
#define LCD_drd 0x9003

#define BUSY 0x80

#define xon 17
#define xoff 19

#const

char convert[16]= {0xBD,0x30,0x9B,0xBA,0x36,0xAE,0xAF,0x38,
                  0xBF,0xBE,0x3F,0xA7,0x8D,0xB3,0x8F,0x0F};

char cold_msg[12]= {0,0,0,0,0,0,0xae,0xbf,0xbd,0xbe,0,0};


#code

/*   LCD driver   */

LcdReady()
{
   timeout=0;
    dptr = LCD_crd;

   while((*dptr&0x80) && (timeout<500))
    ++timeout;
}

clr_screen()
{
    LcdReady();
 dptr = LCD_cwr;
    *dptr=0x01;
}


goto_xy(x,y)
int x, y;
{
    LcdReady();
 dptr = LCD_cwr;
    switch(y)
 {
 case 0: *dptr=0x80+x; break;
    case 1: *dptr=0xC0+x; break;
    case 2: *dptr=0x94+x; break;
    case 3: *dptr=0xd4+x; break;
    }
}


InitLcd()
{
    LcdReady();
 dptr = LCD_cwr;
    *dptr=0x38;
    LcdReady();
    dptr = LCD_cwr;
    *dptr=0x0c;
    clr_screen();
    goto_xy(0,0);
 delay_ms(100);
}


PutLCD(str)

char *str;
{
    char i;
    for (i=0; str[i] != '\0'; i++)
 {
    LcdReady();
 dptr = LCD_dwr;
    *dptr=str[i];
    }


}

putch_lcd(ch)
char ch;

{
    LcdReady();
 dptr= LCD_dwr;
    *dptr=ch;
}




/* return internal code hex keys and function keys  */

key_code(n)
char n;
{
 char d;
 if(n == 0x16) return 0;
 if(n == 0x21) return 1;
 if(n == 0x1b) return 2;
 if(n == 0x15) return 3;
 if(n == 0x1c) return 4;
 if(n == 0x20) return 5;
 if(n == 0x1a) return 6;
 if(n == 0x14) return 7;
 if(n == 0x22) return 8;
 if(n == 0x1f) return 9;
 if(n == 0x19) return 0xa;
 if(n == 0x13) return 0xb;
 if(n == 3) return 0xc;
 if(n == 0x1e) return 0xd;
 if(n == 0x18) return 0xe;
 if(n == 0x12) return 0xf;

 if(n == 0xc) return 0x10;
 if(n == 0xd) return 0x11;
 if(n == 0xe) return 0x12;
 if(n == 0xf) return 0x13;

 if(n == 6) return 0x14;
 if(n == 7) return 0x15;
 if(n == 8) return 0x16;
 if(n == 9) return 0x17;

 if(n == 0) return 0x18;
 if(n == 1) return 0x19;
 if(n == 2) return 0x1a;
 if(n == 0x24) return 0x1b;

    if(n == 0x23) return 0x1c;
 if(n == 0x1d) return 0x1d;
 if(n == 0x17) return 0x1e;
 if(n == 0x10) return 0x1f;





}

delay_num1()
{
  temp=0;
  temp=0;
}

delay_ms(w)
int w;
{
  for( n = 0; n < w; n++)
   continue;

}


scan()
{
 char key_pressed;
```

```c

    k = 1;
 u = 0;
 key = -1;
 q = 0;

   for(i=0; i<6; i++)
   {
     *port1 = ~k;

  *port2 = buffer[i];

  if(buffer[i] != 0x30 && buffer[i] != 0x38 && buffer[i] != 0x70) delay_ms
  else delay_num1();

  *port2 = 0;

   delay_ms(1);

   o= *port0;

  for(n=0; n<6; n++)
  {
    if((o&1)==0)
    {key=q;



    }

    else q++;
    o = o >> 1;
  }

   k = k << 1;
  }

   o = *port0;

  if((o&0x40)==0) key=0x24;

     key_pressed=key;

  return key_pressed;

}


dot_address()
{
 buffer[0]=buffer[0]&~0x40;
 buffer[1]=buffer[1]&~0x40;


   buffer[2]=buffer[2]|0x40;
    buffer[3]=buffer[3]|0x40;
```

```
     buffer[4]=buffer[4]|0x40;
     buffer[5]=buffer[5]|0x40;

}


dot_data()
{

 buffer[0]=buffer[0]|0x40;
 buffer[1]=buffer[1]|0x40;

 buffer[2]=buffer[2]&~0x40;
    buffer[3]=buffer[3]&~0x40;
     buffer[4]=buffer[4]&~0x40;
     buffer[5]=buffer[5]&~0x40;

}

hex4(h)
int h;
{
    temp16 = h;
 buffer[2]= convert[temp16&0xf];
 temp16>>=4;
 buffer[3]= convert[temp16&0xf];
 temp16>>=4;
 buffer[4]=convert[temp16&0xf];
 temp16>>=4;
 buffer[5]=convert[temp16&0xf];
}


address_display()
{

 temp16 = PC;

 hex4(temp16);


}

data_display()
{
    dptr =PC;

 n = *dptr;

 buffer[0]= convert[n&0xf];
 n = n>>4;
 buffer[1]=convert[n&0xf];
 dot_data();

}

```

```
read_memory()
{
    address_display();
 data_display();
}


key_address()
{

 state = 1;

   read_memory();
    dot_address();
 hit=0;

 }

key_data()
{

 read_memory();
    dot_data();
    hit=0;
 state=2;

}

key_plus()
{

     if(state==1 || state==2)
     {
       PC++;
       read_memory();
    key_data();
   }
   if(state==4)
 {
    start=num;
       hit =0;
    positive=1;


 }

 if(state==5)
 {

     state=6;
  start = num;
  hit=0;
  buffer[0]=0x8f;  /* end cursor */
     return;

 }
```

```c


    if(state==6)
 {

     state=7;
  end = num;
  hit=0;
  buffer[0]=0xb3;  /* destination cursor */

  if(end <= start) print_error();

 }

}



key_minus()
{
   if(state==1 | state ==2)
   {
    PC--;
    read_memory();
 key_data();
   }

   if(state==4)
 {
    start=num;
       hit =0;
       positive=0;
 }
}

data_hex()
{

   dptr = PC;
 x = *dptr;
 if(hit==0) x=0;
 {
  hit =1;
  x = x << 4;
  x = x|key;

  *dptr = x;

  read_memory();

     dot_data();
 }
}

key_PC()
{
     PC=save_PC;
  key_data();
}

hex_address()
{
    if(hit==0) PC=0;
 {
    hit=1;

    PC<<=4;
    PC |= key;
    read_memory();
    dot_address();
 }
}

print_error()
{

  buffer[5]= 0x8f;
  buffer[4]= 3;
  buffer[3]=3;
  buffer[2]=0;
  buffer[1]=0;
  buffer[0]=0;
  state=0;
}


key_go(){

 if(state==1 || state==2)
 {
#asm
   STS SAVE_SP
   LDU USER_U

   LDD PC
   PSHS D

   LDA USER_P
   TFR A,CC
   LDA USER_DP
   TFR A,DP

   LDX USER_X
   LDY USER_Y
   LDB USER_B
   LDA USER_A
   RTS

#endasm
 }

   if(state==4)
 {

    desti = num;

   if(positive==0) start= start-desti;
      else start = start+desti;

    hex4(start);
    hit=0;

 }

 if(state==7)
 {
  desti = num;
  temp = end-start;
  dptr = start;
  dptr2 = desti;

  for(i=0; i<temp; i++)
  {
    *(dptr2+i)=*(dptr+i);
  }
  PC = desti;
        read_memory();
        dot_data();
  state=2;



 }


}


key_reg()
{
   buffer[7]=0;
   buffer[6]=0;
   buffer[5]= 0x03;
   buffer[4]= 0x8F;
   buffer[3]= 0xad;
   buffer[2]=0;
   buffer[1]=0;
   buffer[0]=0;

   state = 3;    /* register display state = 3 with hex key */

}


acca()
{

    n = USER_A;

 buffer[2]= convert[n&0xf];
 n = n>>4;
 buffer[3]=convert[n&0xf];
 buffer[4]=0;
 buffer[5]=0;
 buffer[1]=0;
 buffer[0]=0x3f;
}

accb()
{

    n = USER_B;

 buffer[2]= convert[n&0xf];
 n = n>>4;
 buffer[3]=convert[n&0xf];
 buffer[4]=0;
 buffer[5]=0;
 buffer[1]=0;
 buffer[0]=0xa7;
}

ab()
{

    n = USER_B;

 buffer[2]= convert[n&0xf];
 n = n>>4;
 buffer[3]=convert[n&0xf];

 n = USER_A;
    buffer[4]= convert[n&0xf];
 n = n>>4;
 buffer[5]=convert[n&0xf];


 buffer[1]=0x3f;
 buffer[0]=0xa7;
}

reg_x()
{
 temp16 = USER_X;

 hex4(temp16);


 buffer[1] = 0;
 buffer[0] = 0x13;

}

reg_y()
```

```
{
 temp16 = USER_Y;
     hex4(temp16);


 buffer[1] = 0;
 buffer[0] = 0xb6;

}

reg_u()
{
    temp16 = USER_U;
 hex4(temp16);


 buffer[1] = 0;
 buffer[0] = 0xb5;

}

reg_s()
{

 temp16 = SAVE_SP;
 hex4(temp16);


 buffer[1] = 0;
 buffer[0] = 0xae;
}

reg_dp()
{

 n = USER_DP;

 buffer[2]= convert[n&0xf];
 n = n>>4;
 buffer[3]=convert[n&0xf];
 buffer[4]=0;
 buffer[5]=0;
 buffer[1]=0xb3;
 buffer[0]=0x1F;
}

low_cc()
{
  n = USER_P;
  if(n&1) buffer[2]=0x30; else buffer[2]=0xbd;
  if(n&2) buffer[3]=0x30; else buffer[3]=0xbd;
  if(n&4) buffer[4]=0x30; else buffer[4]=0xbd;
  if(n&8) buffer[5]=0x30; else buffer[5]=0xbd;

 buffer[1]=0x8d;
 buffer[0]=0x85;
}

hi_cc()
{
  n = USER_P;
  if(n&0x10) buffer[2]=0x30; else buffer[2]=0xbd;
  if(n&0x20) buffer[3]=0x30; else buffer[3]=0xbd;
  if(n&0x40) buffer[4]=0x30; else buffer[4]=0xbd;
  if(n&0x80) buffer[5]=0x30; else buffer[5]=0xbd;

 buffer[1]=0x8d;
 buffer[0]=0x37;

}



reg_display()
{

  switch(key)
 {
   case 0: acca(); break;
   case 1: accb(); break;
   case 2: ab(); break;
   case 6: reg_x(); break;
   case 7: reg_y(); break;
   case 9: reg_u(); break;
   case 10: reg_s(); break;
   case 8: reg_dp(); break;
   case 5: low_cc(); break;
   case 4: hi_cc(); break;
    }
}

/* insert byte and shift 512 bytes down */

insert()
{
 if(state==1 || state==2)
 {
 dptr=PC;
    for(j=512; j>0; j--)
 {
  *(dptr+j)=*(dptr+j-1);
 }
 *(dptr+1)=0;  /* insert next byte */
 PC++;
    read_memory();
 state=2;
 }
}


/* delete current byte and shift 512 bytes up */

```

```
cut_byte()
{
   if(state==1 || state==2)
 {

  dptr=PC;
    for(j=0; j<512; j++)
 {
  *(dptr+j)=*(dptr+j+1);
 }
    read_memory();
 state=2;
 }
}

key_test()
{
 /* clear I bit to enable irq */
   #asm
  andcc #$ef
      #endasm
     t=0;
   buffer[0]=0;buffer[1]=0;

  while(1)
 {

   while(tick<10)
     scan();
  tick=0;
  hex4(t);
     *gpio1 = t;
  t++;


 }

}

clear_buffer()
{
 for(i=0; i<6; i++)
  *(buffer+i)=0;
}

key_cal()
{
 state = 4;

    clear_buffer();
    buffer[2]= 0xbd;
 start=0;
 desti=0;
 /*buffer[1] = 0x8d;
    buffer[0] = 0x85;
 */
 hit = 0;

}



enter_num()
{
   if(hit==0) num=0;
 {
    hit=1;

    num<<=4;
    num |= key;
    hex4(num);

 }
}

key_copy()
{
   state=5;
   hit=0;
   clear_buffer();
        buffer[2]= 0xbd;

   buffer[0]=0xae;
   buffer[1]=0;
}




key_exe()
{

   if(flag==0) beep();


 if( key>15)
 {

 switch(key)
   {
  case 0x13: key_address(); break;
  case 0x12: key_data(); break;
  case 0x17: key_plus(); break;
  case 0x16: key_minus(); break;
  case 0x10: key_PC(); break;
  case 0x1b: key_go(); break;
  case 0x11: key_reg(); break;
  case 0x18: insert(); break;
  case 0x19: cut_byte(); break;
  case 0x15: flag = flag^1; break;
  case 0x1a: key_test(); break;
  case 0x1d: key_cal(); break;
  case 0x1c: key_copy(); break;
  case 0x1e: key_dump(); break;
  case 0x1f: key_load(); break;

/*  case 0x14: key_user(); break;  available for user key */

   }
   }

 else
 {

  switch(state)
   {
  case 1: hex_address(); break;
  case 2: data_hex(); break;
  case 3: reg_display(); break;
  case 4: enter_num(); break;
  case 5: enter_num(); break;
  case 6: enter_num(); break;
  case 7: enter_num(); break;

   }

 }

}


delay_beep()
{
   for(j=0; j<2; j++)
   continue;
}


beep()
{
 char x;

   *port2=0;

   for(x=0; x<60; x++)
   {
   *port1 = ~0x80;
    delay_beep();
   *port1 = 0xff;
    delay_beep();
   }

}
```

```

scan1()
{
    while( scan() != -1)
      continue;
   delay_ms(3);

   while(scan() == -1)
      continue;
   delay_ms(3);

    key = scan();

 key = key_code(key);

   key_exe();



}


/* ACIA with 4.9152MHz CPU XTAL, bit rate is 19200, 8n1 */

initacia()
{
        char dummy, *acia, reset, baudrate;
        acia = ACIAPORT;
        baudrate = 0x16;
        reset = 3;
        *(acia) = reset;
        *(acia) = baudrate;
        dummy = *(acia+1);      /*clear RBR*/
}

putchar(ch)
char ch;
{
        char *acia;
        acia = ACIAPORT;
        while( ((*acia) & 0x02) == 0)    /* wait on TDRE */
          continue;
        *(acia+1) = ch;

}

puts(s)
char *s;
{
        while( *s ) {
               putchar(*s);
               s++;
        }

}

```

```
getchar()
{
 char ch;
 char *acia;

 acia=ACIAPORT;
 while((*acia&1)==0)
  continue;

    ch = *(acia+1);           /*read 0xA001*/

    return ch;
}

newline()
{
 putchar(0x0a);
 putchar(0x0d);
}

send_hex(n)
char n;
{
   k = n>>4;
   k = k&0xf;

   if (k>9) putchar(k+0x37); else putchar(k+0x30);
   k= n&0xf;
   if (k>9) putchar(k+0x37); else putchar(k+0x30);
}

send_word_hex(n)
int n;
{
   temp16 = n>>8;
   k = temp16&0xff;
   send_hex(k);
   k = n&0xff;
   send_hex(k);
}



key_dump()
{
   int j,p;

   dptr = PC;

   for(j=0; j<16; j++)
   {
     newline();
     send_word_hex(dptr);
     putchar(':');
        for(p=0; p<16; p++)
        {

         send_hex(*(dptr+p));
         putchar(0x20);
         }

        putchar(0x20);

        for (p=0; p<16; p++)
        {
          q=*(dptr+p);
         if(q >= 0x20 && q < 0x80) putchar(q);
          else putchar('.');

        }


         dptr+=16;
   }
   newline();
   PC = dptr;
   key_address();
}

nibble2hex(c)
char c;
{
 char n;
  if(c<0x40) return (c-0x30);
  else return (c-0x37);
}

gethex()
{
  int a,b;

  a = getchar2();
  b = getchar2();

  a = nibble2hex(a)<<4;
  b = nibble2hex(b);
  a = a|b;
  bcc = bcc+a;  /* compute check sum */

  return (a);
}

get16bitaddress()
{
  int load_address;

  load_address =0;

  load_address |= gethex();
  load_address <<=8;
  load_address |= gethex();

  return load_address;
}


read_record1()
{

   char x;
   char byte_count;

   int address16bit;

   bcc =0;

   byte_count = gethex()-3;  /* only data record */

   address16bit = get16bitaddress();

   dptr = address16bit;
  for(x=0; x<byte_count; x++)
   {
    *(dptr+x) = gethex();
   }

   bcc = ~bcc;   /* one's complement */



    save_bcc=  bcc&0xff;

  if(save_bcc != gethex()) bcc_error=1;

}

get_s_record()
{
   end =0;
   bcc_error=0;


   while(end==0)
   {


  while(getchar2() != 'S')
      continue;

      switch(getchar2()) /* get record type */
      {
       case '0': end=0; break;
       case '1': read_record1(); break;
       case '5': end=1; break;
       case '9': end=1; break;
      }
    }

```

```c
   newline();
   if(bcc_error) puts("check sum errors!");
   else puts("0 error...");

    key_data();
}

key_load()
{
  newline();
  puts("Load Motorola s-record (set 1ms delay, character & line)");
     get_s_record();  /* accept only S1 record */

}



initreg()
{
  PC = 0x200;
   save_PC = 0x200;
   USER_U = 0x7F00;
   USER_DP = 0;   /* page zero 6802 compatible */


   #asm
    TFR CC,A
    STA USER_P
   #endasm

   gpio1 = 0x8000;
   port2 = 0x8003;
   port1 = 0x8002;
   port0 = 0x8001;

}

wait1s()
{
    #asm
   andcc #$ef
      #endasm
     while(tick<100);
    tick=0;
}

/* hardware flow control with RTS/CTS */

getchar2()
{
 char ch;
 char *acia;

 acia=ACIAPORT;

 *acia = 0x16; /* enable receiving */

 while((*acia&1)==0)
   ;

  *acia = 0x56; /* stop sending */


    ch = *(acia+1);           /*read 0xA001*/

    *gpio1=ch;

    return ch;
}


main()
{
    initreg();


 *gpio1=0;

 *port2=0;
 *port1=0xff;

 flag=0;

   initacia();

   newline();
   puts("6809 MICROPROCESSOR KIT 2020");

   InitLcd();
   InitLcd();

   PutLCD("6809 MICROPROCESSOR");
   goto_xy(0,1);
   PutLCD("32kB RAM UART LCD");

   buffer[5]= convert[6];
   buffer[4]= convert[8];
   buffer[3]= convert[0];
   buffer[2]= convert[9];
   buffer[1]=0;
   buffer[0]=0;


    while(1)
 {
       scan1();
 }

}



```

```
0001
0002                         * small-c V2.3
0003 7000                           ORG $7000
0004
0005                         * .global i
0006                         i:
0007 7000                     RMB 2
0008
0009                         * .global j
0010                         j:
0011 7002                     RMB 2
0012
0013                         * .global n
0014                         n:
0015 7004                     RMB 1
0016
0017                         * .global k
0018                         k:
0019 7005                     RMB 1
0020
0021                         * .global u
0022                         u:
0023 7006                     RMB 1
0024
0025                         * .global q
0026                         q:
0027 7007                     RMB 1
0028
0029                         * .global o
0030                         o:
0031 7008                     RMB 1
0032
0033                         * .global key
0034                         key:
0035 7009                     RMB 1
0036
0037                         * .global x
0038                         x:
0039 700a                     RMB 1
0040
0041                         * .global hit
0042                         hit:
0043 700b                     RMB 1
0044
0045                         * .global positive
0046                         positive:
0047 700c                     RMB 1
0048
0049                         * .global flag
0050                         flag:
0051 700d                     RMB 1
0052
0053                         * .global tick
0054                         tick:
0055 700e                     RMB 1
0056
```

```
0057                         * .global bcc
0058                         bcc:
0059 700f                     RMB 2
0060
0061                         * .global save_bcc
0062                         save_bcc:
0063 7011                     RMB 2
0064
0065                         * .global bcc_erro
0066                         bcc_erro:
0067 7013                     RMB 2
0068
0069                         * .global temp
0070                         temp:
0071 7015                     RMB 2
0072
0073                         * .global temp16
0074                         temp16:
0075 7017                     RMB 2
0076
0077                         * .global PC
0078                         PC:
0079 7019                     RMB 2
0080
0081                         * .global save_PC
0082                         save_PC:
0083 701b                     RMB 2
0084
0085                         * .global num
0086                         num:
0087 701d                     RMB 2
0088
0089                         * .global start
0090                         start:
0091 701f                     RMB 2
0092
0093                         * .global end
0094                         end:
0095 7021                     RMB 2
0096
0097                         * .global desti
0098                         desti:
0099 7023                     RMB 2
0100
0101                         * .global t
0102                         t:
0103 7025                     RMB 2
0104
0105                         * .global state
0106                         state:
0107 7027                     RMB 1
0108
0109                         * .global USER_PC
0110                         USER_PC:
0111 7028                     RMB 2
0112
```

```
0113                         * .global USER_U
0114                         USER_U:
0115 702a                     RMB 2
0116
0117                         * .global USER_X
0118                         USER_X:
0119 702c                     RMB 2
0120
0121                         * .global SAVE_SP
0122                         SAVE_SP:
0123 702e                     RMB 2
0124
0125                         * .global USER_Y
0126                         USER_Y:
0127 7030                     RMB 2
0128
0129                         * .global USER_A
0130                         USER_A:
0131 7032                     RMB 1
0132
0133                         * .global USER_B
0134                         USER_B:
0135 7033                     RMB 1
0136
0137                         * .global USER_P
0138                         USER_P:
0139 7034                     RMB 1
0140
0141                         * .global USER_DP
0142                         USER_DP:
0143 7035                     RMB 1
0144
0145                         * .global timeout
0146                         timeout:
0147 7036                     RMB 2
0148
0149                         * .global buffer
0150                         buffer:
0151 7038                     RMB 6
0152
0153                         * .global gpio1
0154                         gpio1:
0155 703e 00 00               FDB 0
0156
0157                         * .global port2
0158                         port2:
0159 7040 00 00               FDB 0
0160
0161                         * .global port1
0162                         port1:
0163 7042 00 00               FDB 0
0164
0165                         * .global port0
0166                         port0:
0167 7044 00 00               FDB 0
0168
```

```
0169                         * .global dptr
0170                         dptr:
0171 7046 00 00               FDB 0
0172
0173                         * .global dptr2
0174                         dptr2:
0175 7048 00 00               FDB 0
0176 704a                    ADR1:  RMB 2
0177 704c                    ADR2:  RMB 2
0178 704e                    ADR3:  RMB 1
0179 704f                    ADR31: RMB 3
0180 fffe                       ORG  $fffe
0181 fffe c0 00                 FDB  $c000
0182 fff8                       org $fff8
0183                         *   fdb irq_serv
0184 fff8 7f f0                 fdb $7ff0       use ram vector
0185 fffc                       org $fffc
0186 fffc 7f f3                 fdb $7ff3        nmi vector
0187 fff6                       org $fff6
0188 fff6 7f f6                 fdb $7ff6        firq vector
0189 fffa                       org $fffa
0190 fffa c0 27                 fdb swi_serv
0191 c000                       ORG  $c000
0192 c000 10 ce 7f f0           lds  #$7ff0
0193 c004 86 7e                 lda #$7e        store jmp instruction
0194 c006 b7 7f f0              sta $7ff0       irq vector
0195 c009 8e c0 23              ldx #irq_serv
0196 c00c bf 7f f1              stx $7ff1
0197 c00f 86 3b                 lda #$3b        store rti instruction
0198 c011 b7 7f f3              sta $7ff3       must be modified when test
0199 c014 b7 7f f6              sta $7ff6       with ram vector
0200 c017 8e 00 00              ldx #0
0201 c01a bf 7f f4              stx $7ff4
0202 c01d bf 7f f7              stx $7ff7
0203 c020 7e e8 10              jmp  main
0204                         irq_serv
0205 c023 7c 70 0e              inc tick
0206 c026 3b                    rti
0207                         swi_serv
0208 c027 35 02                 PULS A
0209 c029 b7 70 34              STA USER_P
0210 c02c 35 02                 PULS A
0211 c02e b7 70 32              STA USER_A
0212 c031 35 02                 PULS A
0213 c033 b7 70 33              STA USER_B
0214 c036 35 02                 PULS A
0215 c038 b7 70 35              STA USER_DP
0216 c03b 35 10                 PULS X
0217 c03d bf 70 2c              STX USER_X
0218 c040 35 10                 PULS X
0219 c042 bf 70 30              STX USER_Y
0220 c045 35 10                 PULS X
0221 c047 bf 70 2a              STX USER_U
0222 c04a 35 10                 PULS X
0223 c04c bf 70 28              STX USER_PC
0224 c04f bf 70 1b              stx save_PC
```

```
0225 c052 10 fe 70 2e           LDS SAVE_SP
0226 c056 bd d0 5b              JSR key_PC
0227 c059 39                    rts
0228                         *
0229                         * 16 bit division
0230                         *
0231                         *
0232                         * D=X/D
0233                         *
0234 c05a 7f 70 4f           ccdiv: CLR ADR31
0235 c05d bf 70 4a            STX ADR1
0236 c060 fd 70 4c            STD ADR2
0237 c063 2e 0b              ccd1: BGT ccd2
0238 c065 73 70 4f            COM ADR31
0239 c068 43                  COMA
0240 c069 53                  COMB
0241 c06a c3 00 01            ADDD #1
0242 c06d fd 70 4c            STD ADR2
0243 c070 fc 70 4a           ccd2: LDD ADR1
0244 c073 10 83 00 00         CMPD #0
0245 c077 2e 0b               BGT ccd3
0246 c079 73 70 4f            COM ADR31
0247 c07c 43                  COMA
0248 c07d 53                  COMB
0249 c07e c3 00 01            ADDD #1
0250 c081 fd 70 4a            STD ADR1
0251 c084 86 10              ccd3: LDA #16
0252 c086 b7 70 4e            STA ADR3
0253 c089 4f                  CLRA
0254 c08a 5f                  CLRB
0255                         DIVD:
0256 c08b 78 70 4b            ASL ADR1+1
0257 c08e 79 70 4a            ROL ADR1
0258 c091 59                  ROLB
0259 c092 49                  ROLA
0260 c093 10 b3 70 4c         CMPD ADR2
0261 c097 25 06               BLO NOSUB
0262 c099 b3 70 4c            SUBD ADR2
0263 c09c 7c 70 4b            INC ADR1+1
0264 c09f 7a 70 4e           NOSUB: DEC ADR3
0265 c0a2 26 e7               BNE DIVD
0266 c0a4 1f 01               TFR D,X
0267 c0a6 fc 70 4a            LDD ADR1
0268 c0a9 7d 70 4f            TST ADR31
0269 c0ac 27 05               BEQ ccd4
0270 c0ae 43                  COMA
0271 c0af 53                  COMB
0272 c0b0 c3 00 01            ADDD #1
0273 c0b3 39                 ccd4: RTS
0274                         *
0275                         * 16 bit multiplication
0276                         *
0277 c0b4 bf 70 4a           ccmult: STX ADR1
0278 c0b7 fd 70 4c            STD ADR2
0279 c0ba 7f 70 4e            CLR ADR3
0280 c0bd 7f 70 4f            CLR ADR3+1
```

```
0281 c0c0 b6 70 4b            LDA ADR1+1
0282 c0c3 f6 70 4d            LDB ADR2+1
0283 c0c6 3d                  MUL
0284 c0c7 fd 70 50            STD ADR3+2
0285 c0ca b6 70 4a            LDA ADR1
0286 c0cd f6 70 4d            LDB ADR2+1
0287 c0d0 3d                  MUL
0288 c0d1 f3 70 4f            ADDD ADR3+1
0289 c0d4 fd 70 4f            STD ADR3+1
0290 c0d7 b6 70 4b            LDA ADR1+1
0291 c0da f6 70 4c            LDB ADR2
0292 c0dd 3d                  MUL
0293 c0de f3 70 4f            ADDD ADR3+1
0294 c0e1 fd 70 4f            STD ADR3+1
0295 c0e4 24 03               BCC NOCARRY
0296 c0e6 7c 70 4e            INC ADR3
0297 c0e9 b6 70 4a           NOCARRY: LDA ADR1
0298 c0ec f6 70 4c            LDB ADR2
0299 c0ef 3d                  MUL
0300 c0f0 f3 70 4e            ADDD ADR3
0301 c0f3 1f 01               TFR D,X
0302 c0f5 fc 70 50            LDD ADR3+2
0303 c0f8 39                  RTS
0304                         *
0305                         *  switch statement
0306                         *
0307                         * D = switch value
0308                         * S = switch table
0309                         *     FDB addr1, value1
0310                         *     FDB addr2, value2
0311                         *     ...
0312                         *     FDB 0
0313                         *     [JMP DEFAULT]
0314                         *     continuation
0315                         *
0316 c0f9 35 10              ccswitch: PULS X get stack adr
0317 c0fb 10 ae 81           SWLOOP: LDY ,X++ get address
0318 c0fe 10 8c 00 00                CMPY #0 if 0
0319 c102 27 07                      BEQ SWEND then it is the default
0320 c104 10 a3 81                   CMPD ,X++ else, if it is not the swit
0321 c107 26 f2                      BNE SWLOOP try next one
0322 c109 6e a4                      JMP ,Y else we found it
0323 c10b 6e 84              SWEND:  JMP ,X default exit
0324
0325                         *  .area  CONST  (REL,CON)
0326
0327                         * .global convert
0328                         convert:
0329 c10d bd 30 9b ba 36 ae   FCB 189,48,155,186,54,174,175,56,191,190
     af 38 bf be
0330 c117 3f a7 8d b3 8f 0f   FCB 63,167,141,179,143,15
0331
0332                         * .global cold_msg
0333                         cold_msg:
0334 c11d 00 00 00 00 00 00   FCB 0,0,0,0,0,0,174,191,189,190
     ae bf bd be
```

```
0335 c127 00 00               FCB 0,0
0336
0337                         *  .area  ROMCODE  (REL,CON)
0338
0339                         * .module LcdReady
0340
0341                         * .global LcdReady
0342                         LcdReady:
0343 c129 cc 00 00            ldd  #0
0344 c12c fd 70 36            std  timeout
0345 c12f cc 90 02            ldd  #-28670
0346 c132 fd 70 46            std  dptr
0347                         cc2:
0348 c135 fc 70 46            ldd  dptr
0349 c138 34 06               pshs d
0350 c13a e6 f1               ldb  [,s++]
0351 c13c 1d                  sex
0352 c13d 34 06               pshs d
0353 c13f cc 00 80            ldd  #128
0354 c142 a4 e0               anda ,s+
0355 c144 e4 e0               andb ,s+
0356 c146 10 83 00 00         cmpd #0
0357 c14a 10 27 00 20         lbeq cc4 ;_  instruction flagged for non opt
0358 c14e fc 70 36            ldd  timeout
0359 c151 34 06               pshs d
0360 c153 cc 01 f4            ldd  #500
0361 c156 10 a3 e1            cmpd ,s++
0362 c159 2e 05               bgt  *+7
0363 c15b cc 00 00            ldd  #0
0364 c15e 20 03               bra  *+5
0365 c160 cc 00 01            ldd  #1
0366 c163 10 83 00 00         cmpd #0
0367 c167 10 27 00 03         lbeq cc4 ;_  instruction flagged for non opt
0368 c16b cc 00 01            ldd  #1
0369                         cc4:
0370 c16e 10 83 00 00         cmpd #0
0371 c172 10 27 00 0c         lbeq cc3
0372 c176 fc 70 36            ldd  timeout
0373 c179 c3 00 01            addd #1
0374 c17c fd 70 36            std  timeout
0375 c17f 7e c1 35            jmp cc2
0376                         cc3:
0377 c182 39                  rts
0378
0379                         * .global clr_scre
0380                         clr_scre:
0381 c183 bd c1 29            jsr LcdReady
0382 c186 cc 90 00            ldd  #-28672
0383 c189 fd 70 46            std  dptr
0384 c18c fc 70 46            ldd  dptr
0385 c18f 34 06               pshs d
0386 c191 cc 00 01            ldd  #1
0387 c194 e7 f1               stb  [,s++]
0388 c196 39                  rts
0389
0390                         * .global goto_xy
```

```
0391                         goto_xy:
0392 c197 bd c1 29            jsr LcdReady
0393 c19a cc 90 00            ldd  #-28672
0394 c19d fd 70 46            std  dptr
0395 c1a0 31 62               leay 2,s
0396 c1a2 1f 20               tfr  y,d
0397 c1a4 34 06               pshs d
0398 c1a6 ec f1               ldd  [,s++]
0399 c1a8 7e c2 12            jmp cc7
0400                         cc8:
0401 c1ab fc 70 46            ldd  dptr
0402 c1ae 34 06               pshs d
0403 c1b0 cc 00 80            ldd  #128
0404 c1b3 34 06               pshs d
0405 c1b5 31 68               leay 8,s
0406 c1b7 1f 20               tfr  y,d
0407 c1b9 34 06               pshs d
0408 c1bb ec f1               ldd  [,s++]
0409 c1bd e3 e1               addd ,s++
0410 c1bf e7 f1               stb  [,s++]
0411 c1c1 7e c2 27            jmp cc6
0412                         cc9:
0413 c1c4 fc 70 46            ldd  dptr
0414 c1c7 34 06               pshs d
0415 c1c9 cc 00 c0            ldd  #192
0416 c1cc 34 06               pshs d
0417 c1ce 31 68               leay 8,s
0418 c1d0 1f 20               tfr  y,d
0419 c1d2 34 06               pshs d
0420 c1d4 ec f1               ldd  [,s++]
0421 c1d6 e3 e1               addd ,s++
0422 c1d8 e7 f1               stb  [,s++]
0423 c1da 7e c2 27            jmp cc6
0424                         cc10:
0425 c1dd fc 70 46            ldd  dptr
0426 c1e0 34 06               pshs d
0427 c1e2 cc 00 94            ldd  #148
0428 c1e5 34 06               pshs d
0429 c1e7 31 68               leay 8,s
0430 c1e9 1f 20               tfr  y,d
0431 c1eb 34 06               pshs d
0432 c1ed ec f1               ldd  [,s++]
0433 c1ef e3 e1               addd ,s++
0434 c1f1 e7 f1               stb  [,s++]
0435 c1f3 7e c2 27            jmp cc6
0436                         cc11:
0437 c1f6 fc 70 46            ldd  dptr
0438 c1f9 34 06               pshs d
0439 c1fb cc 00 d4            ldd  #212
0440 c1fe 34 06               pshs d
0441 c200 31 68               leay 8,s
0442 c202 1f 20               tfr  y,d
0443 c204 34 06               pshs d
0444 c206 ec f1               ldd  [,s++]
0445 c208 e3 e1               addd ,s++
0446 c20a e7 f1               stb  [,s++]
```

```
0447 c20c 7e c2 27            jmp cc6
0448 c20f 7e c2 27            jmp cc6
0449                         cc7:
0450 c212 bd c0 f9            jsr ccswitch
0451 c215 c1 ab 00 00         FDB cc8,0
0452 c219 c1 c4 00 01         FDB cc9,1
0453 c21d c1 dd 00 02         FDB cc10,2
0454 c221 c1 f6 00 03         FDB cc11,3
0455 c225 00 00               FDB 0
0456                         cc6:
0457 c227 39                  rts
0458
0459                         * .global InitLcd
0460                         InitLcd:
0461 c228 bd c1 29            jsr LcdReady
0462 c22b cc 90 00            ldd  #-28672
0463 c22e fd 70 46            std  dptr
0464 c231 fc 70 46            ldd  dptr
0465 c234 34 06               pshs d
0466 c236 cc 00 38            ldd  #56
0467 c239 e7 f1               stb  [,s++]
0468 c23b bd c1 29            jsr LcdReady
0469 c23e cc 90 00            ldd  #-28672
0470 c241 fd 70 46            std  dptr
0471 c244 fc 70 46            ldd  dptr
0472 c247 34 06               pshs d
0473 c249 cc 00 0c            ldd  #12
0474 c24c e7 f1               stb  [,s++]
0475 c24e bd c1 83            jsr clr_scre
0476 c251 cc 00 00            ldd  #0
0477 c254 34 06               pshs d
0478 c256 cc 00 00            ldd  #0
0479 c259 34 06               pshs d
0480 c25b bd c1 97            jsr goto_xy
0481 c25e 32 64               leas 4,s
0482 c260 cc 00 64            ldd  #100
0483 c263 34 06               pshs d
0484 c265 bd c8 41            jsr delay_ms
0485 c268 32 62               leas 2,s
0486 c26a 39                  rts
0487
0488                         * .global PutLCD
0489                         PutLCD:
0490 c26b 32 7f               leas -1,s
0491 c26d 31 e4               leay 0,s
0492 c26f 1f 20               tfr  y,d
0493 c271 34 06               pshs d
0494 c273 cc 00 00            ldd  #0
0495 c276 e7 f1               stb  [,s++]
0496                         cc14:
0497 c278 31 63               leay 3,s
0498 c27a 1f 20               tfr  y,d
0499 c27c 34 06               pshs d
0500 c27e ec f1               ldd  [,s++]
0501 c280 34 06               pshs d
0502 c282 31 62               leay 2,s
```

```
0503 c284 1f 20               tfr  y,d
0504 c286 34 06               pshs d
0505 c288 e6 f1               ldb  [,s++]
0506 c28a 1d                  sex
0507 c28b e3 e1               addd ,s++
0508 c28d 34 06               pshs d
0509 c28f e6 f1               ldb  [,s++]
0510 c291 1d                  sex
0511 c292 34 06               pshs d
0512 c294 cc 00 00            ldd  #0
0513 c297 10 a3 e1            cmpd ,s++
0514 c29a 26 05               bne   *+7
0515 c29c cc 00 00            ldd  #0
0516 c29f 20 03               bra  *+5
0517 c2a1 cc 00 01            ldd  #1
0518 c2a4 10 83 00 00         cmpd #0
0519 c2a8 10 27 00 46         lbeq cc13
0520 c2ac 7e c2 c5            jmp cc15
0521                         cc12:
0522 c2af 31 e4               leay 0,s
0523 c2b1 1f 20               tfr  y,d
0524 c2b3 34 06               pshs d
0525 c2b5 34 06               pshs d
0526 c2b7 e6 f1               ldb  [,s++]
0527 c2b9 1d                  sex
0528 c2ba c3 00 01            addd #1
0529 c2bd e7 f1               stb  [,s++]
0530 c2bf 83 00 01            subd #1
0531 c2c2 7e c2 78            jmp cc14
0532                         cc15:
0533 c2c5 bd c1 29            jsr LcdReady
0534 c2c8 cc 90 01            ldd  #-28671
0535 c2cb fd 70 46            std  dptr
0536 c2ce fc 70 46            ldd  dptr
0537 c2d1 34 06               pshs d
0538 c2d3 31 65               leay 5,s
0539 c2d5 1f 20               tfr  y,d
0540 c2d7 34 06               pshs d
0541 c2d9 ec f1               ldd  [,s++]
0542 c2db 34 06               pshs d
0543 c2dd 31 64               leay 4,s
0544 c2df 1f 20               tfr  y,d
0545 c2e1 34 06               pshs d
0546 c2e3 e6 f1               ldb  [,s++]
0547 c2e5 1d                  sex
0548 c2e6 e3 e1               addd ,s++
0549 c2e8 34 06               pshs d
0550 c2ea e6 f1               ldb  [,s++]
0551 c2ec 1d                  sex
0552 c2ed e7 f1               stb  [,s++]
0553 c2ef 7e c2 af            jmp cc12
0554                         cc13:
0555 c2f2 32 61               leas 1,s
0556 c2f4 39                  rts
0557
0558                         * .global putch_lc
```

```
0559                         putch_lc:
0560 c2f5 bd c1 29            jsr LcdReady
0561 c2f8 cc 90 01            ldd  #-28671
0562 c2fb fd 70 46            std  dptr
0563 c2fe fc 70 46            ldd  dptr
0564 c301 34 06               pshs d
0565 c303 31 65               leay 5,s
0566 c305 1f 20               tfr  y,d
0567 c307 34 06               pshs d
0568 c309 e6 f1               ldb  [,s++]
0569 c30b 1d                  sex
0570 c30c e7 f1               stb  [,s++]
0571 c30e 39                  rts
0572
0573                         * .global key_code
0574                         key_code:
0575 c30f 32 7f               leas -1,s
0576 c311 31 64               leay 4,s
0577 c313 1f 20               tfr  y,d
0578 c315 34 06               pshs d
0579 c317 e6 f1               ldb  [,s++]
0580 c319 1d                  sex
0581 c31a 34 06               pshs d
0582 c31c cc 00 16            ldd  #22
0583 c31f 10 a3 e1            cmpd ,s++
0584 c322 27 05               beq  *+7
0585 c324 cc 00 00            ldd  #0
0586 c327 20 03               bra  *+5
0587 c329 cc 00 01            ldd  #1
0588 c32c 10 83 00 00         cmpd #0
0589 c330 10 27 00 06         lbeq cc16
0590 c334 cc 00 00            ldd  #0
0591 c337 32 61               leas 1,s
0592 c339 39                  rts
0593                         cc16:
0594 c33a 31 64               leay 4,s
0595 c33c 1f 20               tfr  y,d
0596 c33e 34 06               pshs d
0597 c340 e6 f1               ldb  [,s++]
0598 c342 1d                  sex
0599 c343 34 06               pshs d
0600 c345 cc 00 21            ldd  #33
0601 c348 10 a3 e1            cmpd ,s++
0602 c34b 27 05               beq  *+7
0603 c34d cc 00 00            ldd  #0
0604 c350 20 03               bra  *+5
0605 c352 cc 00 01            ldd  #1
0606 c355 10 83 00 00         cmpd #0
0607 c359 10 27 00 06         lbeq cc17
0608 c35d cc 00 01            ldd  #1
0609 c360 32 61               leas 1,s
0610 c362 39                  rts
0611                         cc17:
0612 c363 31 64               leay 4,s
0613 c365 1f 20               tfr  y,d
0614 c367 34 06               pshs d
```

```
0615 c369 e6 f1                ldb  [,s++]
0616 c36b 1d                   sex
0617 c36c 34 06                pshs d
0618 c36e cc 00 1b             ldd  #27
0619 c371 10 a3 e1             cmpd ,s++
0620 c374 27 05                beq  *+7
0621 c376 cc 00 00             ldd  #0
0622 c379 20 03                bra  *+5
0623 c37b cc 00 01             ldd  #1
0624 c37e 10 83 00 00          cmpd #0
0625 c382 10 27 00 06          lbeq cc18
0626 c386 cc 00 02             ldd  #2
0627 c389 32 61                leas 1,s
0628 c38b 39                   rts
0629                          cc18:
0630 c38c 31 64                leay 4,s
0631 c38e 1f 20                tfr  y,d
0632 c390 34 06                pshs d
0633 c392 e6 f1                ldb  [,s++]
0634 c394 1d                   sex
0635 c395 34 06                pshs d
0636 c397 cc 00 15             ldd  #21
0637 c39a 10 a3 e1             cmpd ,s++
0638 c39d 27 05                beq  *+7
0639 c39f cc 00 00             ldd  #0
0640 c3a2 20 03                bra  *+5
0641 c3a4 cc 00 01             ldd  #1
0642 c3a7 10 83 00 00          cmpd #0
0643 c3ab 10 27 00 06          lbeq cc19
0644 c3af cc 00 03             ldd  #3
0645 c3b2 32 61                leas 1,s
0646 c3b4 39                   rts
0647                          cc19:
0648 c3b5 31 64                leay 4,s
0649 c3b7 1f 20                tfr  y,d
0650 c3b9 34 06                pshs d
0651 c3bb e6 f1                ldb  [,s++]
0652 c3bd 1d                   sex
0653 c3be 34 06                pshs d
0654 c3c0 cc 00 1c             ldd  #28
0655 c3c3 10 a3 e1             cmpd ,s++
0656 c3c6 27 05                beq  *+7
0657 c3c8 cc 00 00             ldd  #0
0658 c3cb 20 03                bra  *+5
0659 c3cd cc 00 01             ldd  #1
0660 c3d0 10 83 00 00          cmpd #0
0661 c3d4 10 27 00 06          lbeq cc20
0662 c3d8 cc 00 04             ldd  #4
0663 c3db 32 61                leas 1,s
0664 c3dd 39                   rts
0665                          cc20:
0666 c3de 31 64                leay 4,s
0667 c3e0 1f 20                tfr  y,d
0668 c3e2 34 06                pshs d
0669 c3e4 e6 f1                ldb  [,s++]
0670 c3e6 1d                   sex
```

```
0671 c3e7 34 06                pshs d
0672 c3e9 cc 00 20             ldd  #32
0673 c3ec 10 a3 e1             cmpd ,s++
0674 c3ef 27 05                beq  *+7
0675 c3f1 cc 00 00             ldd  #0
0676 c3f4 20 03                bra  *+5
0677 c3f6 cc 00 01             ldd  #1
0678 c3f9 10 83 00 00          cmpd #0
0679 c3fd 10 27 00 06          lbeq cc21
0680 c401 cc 00 05             ldd  #5
0681 c404 32 61                leas 1,s
0682 c406 39                   rts
0683                          cc21:
0684 c407 31 64                leay 4,s
0685 c409 1f 20                tfr  y,d
0686 c40b 34 06                pshs d
0687 c40d e6 f1                ldb  [,s++]
0688 c40f 1d                   sex
0689 c410 34 06                pshs d
0690 c412 cc 00 1a             ldd  #26
0691 c415 10 a3 e1             cmpd ,s++
0692 c418 27 05                beq  *+7
0693 c41a cc 00 00             ldd  #0
0694 c41d 20 03                bra  *+5
0695 c41f cc 00 01             ldd  #1
0696 c422 10 83 00 00          cmpd #0
0697 c426 10 27 00 06          lbeq cc22
0698 c42a cc 00 06             ldd  #6
0699 c42d 32 61                leas 1,s
0700 c42f 39                   rts
0701                          cc22:
0702 c430 31 64                leay 4,s
0703 c432 1f 20                tfr  y,d
0704 c434 34 06                pshs d
0705 c436 e6 f1                ldb  [,s++]
0706 c438 1d                   sex
0707 c439 34 06                pshs d
0708 c43b cc 00 14             ldd  #20
0709 c43e 10 a3 e1             cmpd ,s++
0710 c441 27 05                beq  *+7
0711 c443 cc 00 00             ldd  #0
0712 c446 20 03                bra  *+5
0713 c448 cc 00 01             ldd  #1
0714 c44b 10 83 00 00          cmpd #0
0715 c44f 10 27 00 06          lbeq cc23
0716 c453 cc 00 07             ldd  #7
0717 c456 32 61                leas 1,s
0718 c458 39                   rts
0719                          cc23:
0720 c459 31 64                leay 4,s
0721 c45b 1f 20                tfr  y,d
0722 c45d 34 06                pshs d
0723 c45f e6 f1                ldb  [,s++]
0724 c461 1d                   sex
0725 c462 34 06                pshs d
0726 c464 cc 00 22             ldd  #34
```

```
0727 c467 10 a3 e1            cmpd ,s++
0728 c46a 27 05               beq  *+7
0729 c46c cc 00 00            ldd  #0
0730 c46f 20 03               bra  *+5
0731 c471 cc 00 01            ldd  #1
0732 c474 10 83 00 00         cmpd #0
0733 c478 10 27 00 06         lbeq cc24
0734 c47c cc 00 08            ldd  #8
0735 c47f 32 61               leas 1,s
0736 c481 39                  rts
0737                         cc24:
0738 c482 31 64               leay 4,s
0739 c484 1f 20               tfr  y,d
0740 c486 34 06               pshs d
0741 c488 e6 f1               ldb  [,s++]
0742 c48a 1d                  sex
0743 c48b 34 06               pshs d
0744 c48d cc 00 1f            ldd  #31
0745 c490 10 a3 e1            cmpd ,s++
0746 c493 27 05               beq  *+7
0747 c495 cc 00 00            ldd  #0
0748 c498 20 03               bra  *+5
0749 c49a cc 00 01            ldd  #1
0750 c49d 10 83 00 00         cmpd #0
0751 c4a1 10 27 00 06         lbeq cc25
0752 c4a5 cc 00 09            ldd  #9
0753 c4a8 32 61               leas 1,s
0754 c4aa 39                  rts
0755                         cc25:
0756 c4ab 31 64               leay 4,s
0757 c4ad 1f 20               tfr  y,d
0758 c4af 34 06               pshs d
0759 c4b1 e6 f1               ldb  [,s++]
0760 c4b3 1d                  sex
0761 c4b4 34 06               pshs d
0762 c4b6 cc 00 19            ldd  #25
0763 c4b9 10 a3 e1            cmpd ,s++
0764 c4bc 27 05               beq  *+7
0765 c4be cc 00 00            ldd  #0
0766 c4c1 20 03               bra  *+5
0767 c4c3 cc 00 01            ldd  #1
0768 c4c6 10 83 00 00         cmpd #0
0769 c4ca 10 27 00 06         lbeq cc26
0770 c4ce cc 00 0a            ldd  #10
0771 c4d1 32 61               leas 1,s
0772 c4d3 39                  rts
0773                         cc26:
0774 c4d4 31 64               leay 4,s
0775 c4d6 1f 20               tfr  y,d
0776 c4d8 34 06               pshs d
0777 c4da e6 f1               ldb  [,s++]
0778 c4dc 1d                  sex
0779 c4dd 34 06               pshs d
0780 c4df cc 00 13            ldd  #19
0781 c4e2 10 a3 e1            cmpd ,s++
0782 c4e5 27 05               beq  *+7
```

```
0783 c4e7 cc 00 00            ldd  #0
0784 c4ea 20 03               bra  *+5
0785 c4ec cc 00 01            ldd  #1
0786 c4ef 10 83 00 00         cmpd #0
0787 c4f3 10 27 00 06         lbeq cc27
0788 c4f7 cc 00 0b            ldd  #11
0789 c4fa 32 61               leas 1,s
0790 c4fc 39                  rts
0791                         cc27:
0792 c4fd 31 64               leay 4,s
0793 c4ff 1f 20               tfr  y,d
0794 c501 34 06               pshs d
0795 c503 e6 f1               ldb  [,s++]
0796 c505 1d                  sex
0797 c506 34 06               pshs d
0798 c508 cc 00 03            ldd  #3
0799 c50b 10 a3 e1            cmpd ,s++
0800 c50e 27 05               beq  *+7
0801 c510 cc 00 00            ldd  #0
0802 c513 20 03               bra  *+5
0803 c515 cc 00 01            ldd  #1
0804 c518 10 83 00 00         cmpd #0
0805 c51c 10 27 00 06         lbeq cc28
0806 c520 cc 00 0c            ldd  #12
0807 c523 32 61               leas 1,s
0808 c525 39                  rts
0809                         cc28:
0810 c526 31 64               leay 4,s
0811 c528 1f 20               tfr  y,d
0812 c52a 34 06               pshs d
0813 c52c e6 f1               ldb  [,s++]
0814 c52e 1d                  sex
0815 c52f 34 06               pshs d
0816 c531 cc 00 1e            ldd  #30
0817 c534 10 a3 e1            cmpd ,s++
0818 c537 27 05               beq  *+7
0819 c539 cc 00 00            ldd  #0
0820 c53c 20 03               bra  *+5
0821 c53e cc 00 01            ldd  #1
0822 c541 10 83 00 00         cmpd #0
0823 c545 10 27 00 06         lbeq cc29
0824 c549 cc 00 0d            ldd  #13
0825 c54c 32 61               leas 1,s
0826 c54e 39                  rts
0827                         cc29:
0828 c54f 31 64               leay 4,s
0829 c551 1f 20               tfr  y,d
0830 c553 34 06               pshs d
0831 c555 e6 f1               ldb  [,s++]
0832 c557 1d                  sex
0833 c558 34 06               pshs d
0834 c55a cc 00 18            ldd  #24
0835 c55d 10 a3 e1            cmpd ,s++
0836 c560 27 05               beq  *+7
0837 c562 cc 00 00            ldd  #0
0838 c565 20 03               bra  *+5
```

```
0839 c567 cc 00 01            ldd  #1
0840 c56a 10 83 00 00         cmpd #0
0841 c56e 10 27 00 06         lbeq cc30
0842 c572 cc 00 0e            ldd  #14
0843 c575 32 61               leas 1,s
0844 c577 39                  rts
0845                         cc30:
0846 c578 31 64               leay 4,s
0847 c57a 1f 20               tfr  y,d
0848 c57c 34 06               pshs d
0849 c57e e6 f1               ldb  [,s++]
0850 c580 1d                  sex
0851 c581 34 06               pshs d
0852 c583 cc 00 12            ldd  #18
0853 c586 10 a3 e1            cmpd ,s++
0854 c589 27 05               beq  *+7
0855 c58b cc 00 00            ldd  #0
0856 c58e 20 03               bra  *+5
0857 c590 cc 00 01            ldd  #1
0858 c593 10 83 00 00         cmpd #0
0859 c597 10 27 00 06         lbeq cc31
0860 c59b cc 00 0f            ldd  #15
0861 c59e 32 61               leas 1,s
0862 c5a0 39                  rts
0863                         cc31:
0864 c5a1 31 64               leay 4,s
0865 c5a3 1f 20               tfr  y,d
0866 c5a5 34 06               pshs d
0867 c5a7 e6 f1               ldb  [,s++]
0868 c5a9 1d                  sex
0869 c5aa 34 06               pshs d
0870 c5ac cc 00 0c            ldd  #12
0871 c5af 10 a3 e1            cmpd ,s++
0872 c5b2 27 05               beq  *+7
0873 c5b4 cc 00 00            ldd  #0
0874 c5b7 20 03               bra  *+5
0875 c5b9 cc 00 01            ldd  #1
0876 c5bc 10 83 00 00         cmpd #0
0877 c5c0 10 27 00 06         lbeq cc32
0878 c5c4 cc 00 10            ldd  #16
0879 c5c7 32 61               leas 1,s
0880 c5c9 39                  rts
0881                         cc32:
0882 c5ca 31 64               leay 4,s
0883 c5cc 1f 20               tfr  y,d
0884 c5ce 34 06               pshs d
0885 c5d0 e6 f1               ldb  [,s++]
0886 c5d2 1d                  sex
0887 c5d3 34 06               pshs d
0888 c5d5 cc 00 0d            ldd  #13
0889 c5d8 10 a3 e1            cmpd ,s++
0890 c5db 27 05               beq  *+7
0891 c5dd cc 00 00            ldd  #0
0892 c5e0 20 03               bra  *+5
0893 c5e2 cc 00 01            ldd  #1
0894 c5e5 10 83 00 00         cmpd #0
```

```
0895 c5e9 10 27 00 06         lbeq cc33
0896 c5ed cc 00 11            ldd  #17
0897 c5f0 32 61               leas 1,s
0898 c5f2 39                  rts
0899                         cc33:
0900 c5f3 31 64               leay 4,s
0901 c5f5 1f 20               tfr  y,d
0902 c5f7 34 06               pshs d
0903 c5f9 e6 f1               ldb  [,s++]
0904 c5fb 1d                  sex
0905 c5fc 34 06               pshs d
0906 c5fe cc 00 0e            ldd  #14
0907 c601 10 a3 e1            cmpd ,s++
0908 c604 27 05               beq  *+7
0909 c606 cc 00 00            ldd  #0
0910 c609 20 03               bra  *+5
0911 c60b cc 00 01            ldd  #1
0912 c60e 10 83 00 00         cmpd #0
0913 c612 10 27 00 06         lbeq cc34
0914 c616 cc 00 12            ldd  #18
0915 c619 32 61               leas 1,s
0916 c61b 39                  rts
0917                         cc34:
0918 c61c 31 64               leay 4,s
0919 c61e 1f 20               tfr  y,d
0920 c620 34 06               pshs d
0921 c622 e6 f1               ldb  [,s++]
0922 c624 1d                  sex
0923 c625 34 06               pshs d
0924 c627 cc 00 0f            ldd  #15
0925 c62a 10 a3 e1            cmpd ,s++
0926 c62d 27 05               beq  *+7
0927 c62f cc 00 00            ldd  #0
0928 c632 20 03               bra  *+5
0929 c634 cc 00 01            ldd  #1
0930 c637 10 83 00 00         cmpd #0
0931 c63b 10 27 00 06         lbeq cc35
0932 c63f cc 00 13            ldd  #19
0933 c642 32 61               leas 1,s
0934 c644 39                  rts
0935                         cc35:
0936 c645 31 64               leay 4,s
0937 c647 1f 20               tfr  y,d
0938 c649 34 06               pshs d
0939 c64b e6 f1               ldb  [,s++]
0940 c64d 1d                  sex
0941 c64e 34 06               pshs d
0942 c650 cc 00 06            ldd  #6
0943 c653 10 a3 e1            cmpd ,s++
0944 c656 27 05               beq  *+7
0945 c658 cc 00 00            ldd  #0
0946 c65b 20 03               bra  *+5
0947 c65d cc 00 01            ldd  #1
0948 c660 10 83 00 00         cmpd #0
0949 c664 10 27 00 06         lbeq cc36
0950 c668 cc 00 14            ldd  #20
```

```
0951 c66b 32 61               leas 1,s
0952 c66d 39                  rts
0953                         cc36:
0954 c66e 31 64               leay 4,s
0955 c670 1f 20               tfr  y,d
0956 c672 34 06               pshs d
0957 c674 e6 f1               ldb  [,s++]
0958 c676 1d                  sex
0959 c677 34 06               pshs d
0960 c679 cc 00 07            ldd  #7
0961 c67c 10 a3 e1            cmpd ,s++
0962 c67f 27 05               beq  *+7
0963 c681 cc 00 00            ldd  #0
0964 c684 20 03               bra  *+5
0965 c686 cc 00 01            ldd  #1
0966 c689 10 83 00 00         cmpd #0
0967 c68d 10 27 00 06         lbeq cc37
0968 c691 cc 00 15            ldd  #21
0969 c694 32 61               leas 1,s
0970 c696 39                  rts
0971                         cc37:
0972 c697 31 64               leay 4,s
0973 c699 1f 20               tfr  y,d
0974 c69b 34 06               pshs d
0975 c69d e6 f1               ldb  [,s++]
0976 c69f 1d                  sex
0977 c6a0 34 06               pshs d
0978 c6a2 cc 00 08            ldd  #8
0979 c6a5 10 a3 e1            cmpd ,s++
0980 c6a8 27 05               beq  *+7
0981 c6aa cc 00 00            ldd  #0
0982 c6ad 20 03               bra  *+5
0983 c6af cc 00 01            ldd  #1
0984 c6b2 10 83 00 00         cmpd #0
0985 c6b6 10 27 00 06         lbeq cc38
0986 c6ba cc 00 16            ldd  #22
0987 c6bd 32 61               leas 1,s
0988 c6bf 39                  rts
0989                         cc38:
0990 c6c0 31 64               leay 4,s
0991 c6c2 1f 20               tfr  y,d
0992 c6c4 34 06               pshs d
0993 c6c6 e6 f1               ldb  [,s++]
0994 c6c8 1d                  sex
0995 c6c9 34 06               pshs d
0996 c6cb cc 00 09            ldd  #9
0997 c6ce 10 a3 e1            cmpd ,s++
0998 c6d1 27 05               beq  *+7
0999 c6d3 cc 00 00            ldd  #0
1000 c6d6 20 03               bra  *+5
1001 c6d8 cc 00 01            ldd  #1
1002 c6db 10 83 00 00         cmpd #0
1003 c6df 10 27 00 06         lbeq cc39
1004 c6e3 cc 00 17            ldd  #23
1005 c6e6 32 61               leas 1,s
1006 c6e8 39                  rts
```

```
1007                         cc39:
1008 c6e9 31 64               leay 4,s
1009 c6eb 1f 20               tfr  y,d
1010 c6ed 34 06               pshs d
1011 c6ef e6 f1               ldb  [,s++]
1012 c6f1 1d                  sex
1013 c6f2 34 06               pshs d
1014 c6f4 cc 00 00            ldd  #0
1015 c6f7 10 a3 e1            cmpd ,s++
1016 c6fa 27 05               beq  *+7
1017 c6fc cc 00 00            ldd  #0
1018 c6ff 20 03               bra  *+5
1019 c701 cc 00 01            ldd  #1
1020 c704 10 83 00 00         cmpd #0
1021 c708 10 27 00 06         lbeq cc40
1022 c70c cc 00 18            ldd  #24
1023 c70f 32 61               leas 1,s
1024 c711 39                  rts
1025                         cc40:
1026 c712 31 64               leay 4,s
1027 c714 1f 20               tfr  y,d
1028 c716 34 06               pshs d
1029 c718 e6 f1               ldb  [,s++]
1030 c71a 1d                  sex
1031 c71b 34 06               pshs d
1032 c71d cc 00 01            ldd  #1
1033 c720 10 a3 e1            cmpd ,s++
1034 c723 27 05               beq  *+7
1035 c725 cc 00 00            ldd  #0
1036 c728 20 03               bra  *+5
1037 c72a cc 00 01            ldd  #1
1038 c72d 10 83 00 00         cmpd #0
1039 c731 10 27 00 06         lbeq cc41
1040 c735 cc 00 19            ldd  #25
1041 c738 32 61               leas 1,s
1042 c73a 39                  rts
1043                         cc41:
1044 c73b 31 64               leay 4,s
1045 c73d 1f 20               tfr  y,d
1046 c73f 34 06               pshs d
1047 c741 e6 f1               ldb  [,s++]
1048 c743 1d                  sex
1049 c744 34 06               pshs d
1050 c746 cc 00 02            ldd  #2
1051 c749 10 a3 e1            cmpd ,s++
1052 c74c 27 05               beq  *+7
1053 c74e cc 00 00            ldd  #0
1054 c751 20 03               bra  *+5
1055 c753 cc 00 01            ldd  #1
1056 c756 10 83 00 00         cmpd #0
1057 c75a 10 27 00 06         lbeq cc42
1058 c75e cc 00 1a            ldd  #26
1059 c761 32 61               leas 1,s
1060 c763 39                  rts
1061                         cc42:
1062 c764 31 64               leay 4,s
```

```
1063 c766 1f 20               tfr  y,d
1064 c768 34 06               pshs d
1065 c76a e6 f1               ldb  [,s++]
1066 c76c 1d                  sex
1067 c76d 34 06               pshs d
1068 c76f cc 00 24            ldd  #36
1069 c772 10 a3 e1            cmpd ,s++
1070 c775 27 05               beq  *+7
1071 c777 cc 00 00            ldd  #0
1072 c77a 20 03               bra  *+5
1073 c77c cc 00 01            ldd  #1
1074 c77f 10 83 00 00         cmpd #0
1075 c783 10 27 00 06         lbeq cc43
1076 c787 cc 00 1b            ldd  #27
1077 c78a 32 61               leas 1,s
1078 c78c 39                  rts
1079                         cc43:
1080 c78d 31 64               leay 4,s
1081 c78f 1f 20               tfr  y,d
1082 c791 34 06               pshs d
1083 c793 e6 f1               ldb  [,s++]
1084 c795 1d                  sex
1085 c796 34 06               pshs d
1086 c798 cc 00 23            ldd  #35
1087 c79b 10 a3 e1            cmpd ,s++
1088 c79e 27 05               beq  *+7
1089 c7a0 cc 00 00            ldd  #0
1090 c7a3 20 03               bra  *+5
1091 c7a5 cc 00 01            ldd  #1
1092 c7a8 10 83 00 00         cmpd #0
1093 c7ac 10 27 00 06         lbeq cc44
1094 c7b0 cc 00 1c            ldd  #28
1095 c7b3 32 61               leas 1,s
1096 c7b5 39                  rts
1097                         cc44:
1098 c7b6 31 64               leay 4,s
1099 c7b8 1f 20               tfr  y,d
1100 c7ba 34 06               pshs d
1101 c7bc e6 f1               ldb  [,s++]
1102 c7be 1d                  sex
1103 c7bf 34 06               pshs d
1104 c7c1 cc 00 1d            ldd  #29
1105 c7c4 10 a3 e1            cmpd ,s++
1106 c7c7 27 05               beq  *+7
1107 c7c9 cc 00 00            ldd  #0
1108 c7cc 20 03               bra  *+5
1109 c7ce cc 00 01            ldd  #1
1110 c7d1 10 83 00 00         cmpd #0
1111 c7d5 10 27 00 06         lbeq cc45
1112 c7d9 cc 00 1d            ldd  #29
1113 c7dc 32 61               leas 1,s
1114 c7de 39                  rts
1115                         cc45:
1116 c7df 31 64               leay 4,s
1117 c7e1 1f 20               tfr  y,d
1118 c7e3 34 06               pshs d
```

```
1119 c7e5 e6 f1                ldb  [,s++]
1120 c7e7 1d                   sex
1121 c7e8 34 06                pshs d
1122 c7ea cc 00 17             ldd  #23
1123 c7ed 10 a3 e1             cmpd ,s++
1124 c7f0 27 05                beq  *+7
1125 c7f2 cc 00 00             ldd  #0
1126 c7f5 20 03                bra  *+5
1127 c7f7 cc 00 01             ldd  #1
1128 c7fa 10 83 00 00          cmpd #0
1129 c7fe 10 27 00 06          lbeq cc46
1130 c802 cc 00 1e             ldd  #30
1131 c805 32 61                leas 1,s
1132 c807 39                   rts
1133                          cc46:
1134 c808 31 64                leay 4,s
1135 c80a 1f 20                tfr  y,d
1136 c80c 34 06                pshs d
1137 c80e e6 f1                ldb  [,s++]
1138 c810 1d                   sex
1139 c811 34 06                pshs d
1140 c813 cc 00 10             ldd  #16
1141 c816 10 a3 e1             cmpd ,s++
1142 c819 27 05                beq  *+7
1143 c81b cc 00 00             ldd  #0
1144 c81e 20 03                bra  *+5
1145 c820 cc 00 01             ldd  #1
1146 c823 10 83 00 00          cmpd #0
1147 c827 10 27 00 06          lbeq cc47
1148 c82b cc 00 1f             ldd  #31
1149 c82e 32 61                leas 1,s
1150 c830 39                   rts
1151                          cc47:
1152 c831 32 61                leas 1,s
1153 c833 39                   rts
1154
1155                          * .global delay_nu
1156                          delay_nu:
1157 c834 cc 00 00             ldd  #0
1158 c837 fd 70 15             std  temp
1159 c83a cc 00 00             ldd  #0
1160 c83d fd 70 15             std  temp
1161 c840 39                   rts
1162
1163                          * .global delay_ms
1164                          delay_ms:
1165 c841 cc 00 00             ldd  #0
1166 c844 f7 70 04             stb  n
1167                          cc50:
1168 c847 f6 70 04             ldb  n
1169 c84a 1d                   sex
1170 c84b 34 06                pshs d
1171 c84d 31 64                leay 4,s
1172 c84f 1f 20                tfr  y,d
1173 c851 34 06                pshs d
1174 c853 ec f1                ldd  [,s++]
```

```
1175 c855 10 a3 e1            cmpd ,s++
1176 c858 2e 05               bgt  *+7
1177 c85a cc 00 00            ldd  #0
1178 c85d 20 03               bra  *+5
1179 c85f cc 00 01            ldd  #1
1180 c862 10 83 00 00         cmpd #0
1181 c866 10 27 00 19         lbeq cc49
1182 c86a 7e c8 7d            jmp cc51
1183                         cc48:
1184 c86d f6 70 04            ldb  n
1185 c870 1d                  sex
1186 c871 c3 00 01            addd #1
1187 c874 f7 70 04            stb  n
1188 c877 83 00 01            subd #1
1189 c87a 7e c8 47            jmp cc50
1190                         cc51:
1191 c87d 7e c8 6d            jmp cc48
1192 c880 7e c8 6d            jmp cc48
1193                         cc49:
1194 c883 39                  rts
1195
1196                         * .global scan
1197                         scan:
1198 c884 32 7f               leas -1,s
1199 c886 cc 00 01            ldd  #1
1200 c889 f7 70 05            stb  k
1201 c88c cc 00 00            ldd  #0
1202 c88f f7 70 06            stb  u
1203 c892 cc 00 01            ldd  #1
1204 c895 43                  coma
1205 c896 53                  comb
1206 c897 c3 00 01            addd #1
1207 c89a f7 70 09            stb  key
1208 c89d cc 00 00            ldd  #0
1209 c8a0 f7 70 07            stb  q
1210 c8a3 cc 00 00            ldd  #0
1211 c8a6 fd 70 00            std  i
1212                         cc54:
1213 c8a9 fc 70 00            ldd  i
1214 c8ac 34 06               pshs d
1215 c8ae cc 00 06            ldd  #6
1216 c8b1 10 a3 e1            cmpd ,s++
1217 c8b4 2e 05               bgt  *+7
1218 c8b6 cc 00 00            ldd  #0
1219 c8b9 20 03               bra  *+5
1220 c8bb cc 00 01            ldd  #1
1221 c8be 10 83 00 00         cmpd #0
1222 c8c2 10 27 01 9e         lbeq cc53
1223 c8c6 7e c8 d8            jmp cc55
1224                         cc52:
1225 c8c9 fc 70 00            ldd  i
1226 c8cc c3 00 01            addd #1
1227 c8cf fd 70 00            std  i
1228 c8d2 83 00 01            subd #1
1229 c8d5 7e c8 a9            jmp cc54
1230                         cc55:
```

```
1231 c8d8 fc 70 42            ldd  port1
1232 c8db 34 06               pshs d
1233 c8dd f6 70 05            ldb  k
1234 c8e0 1d                  sex
1235 c8e1 43                  coma
1236 c8e2 53                  comb
1237 c8e3 e7 f1               stb  [,s++]
1238 c8e5 fc 70 40            ldd  port2
1239 c8e8 34 06               pshs d
1240 c8ea cc 70 38            ldd  #buffer
1241 c8ed 34 06               pshs d
1242 c8ef fc 70 00            ldd  i
1243 c8f2 e3 e1               addd ,s++
1244 c8f4 34 06               pshs d
1245 c8f6 e6 f1               ldb  [,s++]
1246 c8f8 1d                  sex
1247 c8f9 e7 f1               stb  [,s++]
1248 c8fb cc 70 38            ldd  #buffer
1249 c8fe 34 06               pshs d
1250 c900 fc 70 00            ldd  i
1251 c903 e3 e1               addd ,s++
1252 c905 34 06               pshs d
1253 c907 e6 f1               ldb  [,s++]
1254 c909 1d                  sex
1255 c90a 34 06               pshs d
1256 c90c cc 00 30            ldd  #48
1257 c90f 10 a3 e1            cmpd ,s++
1258 c912 26 05               bne   *+7
1259 c914 cc 00 00            ldd  #0
1260 c917 20 03               bra  *+5
1261 c919 cc 00 01            ldd  #1
1262 c91c 10 83 00 00         cmpd #0
1263 c920 10 27 00 2c         lbeq cc57 ;_  instruction flagged for non op
1264 c924 cc 70 38            ldd  #buffer
1265 c927 34 06               pshs d
1266 c929 fc 70 00            ldd  i
1267 c92c e3 e1               addd ,s++
1268 c92e 34 06               pshs d
1269 c930 e6 f1               ldb  [,s++]
1270 c932 1d                  sex
1271 c933 34 06               pshs d
1272 c935 cc 00 38            ldd  #56
1273 c938 10 a3 e1            cmpd ,s++
1274 c93b 26 05               bne   *+7
1275 c93d cc 00 00            ldd  #0
1276 c940 20 03               bra  *+5
1277 c942 cc 00 01            ldd  #1
1278 c945 10 83 00 00         cmpd #0
1279 c949 10 27 00 03         lbeq cc57 ;_  instruction flagged for non op
1280 c94d cc 00 01            ldd  #1
1281                         cc57:
1282 c950 10 83 00 00         cmpd #0
1283 c954 10 27 00 2c         lbeq cc58 ;_  instruction flagged for non op
1284 c958 cc 70 38            ldd  #buffer
1285 c95b 34 06               pshs d
1286 c95d fc 70 00            ldd  i
```

```
1287 c960 e3 e1               addd ,s++
1288 c962 34 06               pshs d
1289 c964 e6 f1               ldb  [,s++]
1290 c966 1d                  sex
1291 c967 34 06               pshs d
1292 c969 cc 00 70            ldd  #112
1293 c96c 10 a3 e1            cmpd ,s++
1294 c96f 26 05               bne   *+7
1295 c971 cc 00 00            ldd  #0
1296 c974 20 03               bra  *+5
1297 c976 cc 00 01            ldd  #1
1298 c979 10 83 00 00         cmpd #0
1299 c97d 10 27 00 03         lbeq cc58 ;_  instruction flagged for non op
1300 c981 cc 00 01            ldd  #1
1301                         cc58:
1302 c984 10 83 00 00         cmpd #0
1303 c988 10 27 00 0d         lbeq cc56
1304 c98c cc 00 02            ldd  #2
1305 c98f 34 06               pshs d
1306 c991 bd c8 41            jsr delay_ms
1307 c994 32 62               leas 2,s
1308 c996 7e c9 9c            jmp cc59
1309                         cc56:
1310 c999 bd c8 34            jsr delay_nu
1311                         cc59:
1312 c99c fc 70 40            ldd  port2
1313 c99f 34 06               pshs d
1314 c9a1 cc 00 00            ldd  #0
1315 c9a4 e7 f1               stb  [,s++]
1316 c9a6 cc 00 01            ldd  #1
1317 c9a9 34 06               pshs d
1318 c9ab bd c8 41            jsr delay_ms
1319 c9ae 32 62               leas 2,s
1320 c9b0 fc 70 44            ldd  port0
1321 c9b3 34 06               pshs d
1322 c9b5 e6 f1               ldb  [,s++]
1323 c9b7 1d                  sex
1324 c9b8 f7 70 08            stb  o
1325 c9bb cc 00 00            ldd  #0
1326 c9be f7 70 04            stb  n
1327                         cc62:
1328 c9c1 f6 70 04            ldb  n
1329 c9c4 1d                  sex
1330 c9c5 34 06               pshs d
1331 c9c7 cc 00 06            ldd  #6
1332 c9ca 10 a3 e1            cmpd ,s++
1333 c9cd 2e 05               bgt  *+7
1334 c9cf cc 00 00            ldd  #0
1335 c9d2 20 03               bra  *+5
1336 c9d4 cc 00 01            ldd  #1
1337 c9d7 10 83 00 00         cmpd #0
1338 c9db 10 27 00 6b         lbeq cc61
1339 c9df 7e c9 f2            jmp cc63
1340                         cc60:
1341 c9e2 f6 70 04            ldb  n
1342 c9e5 1d                  sex
```

```
1343 c9e6 c3 00 01            addd #1
1344 c9e9 f7 70 04            stb  n
1345 c9ec 83 00 01            subd #1
1346 c9ef 7e c9 c1            jmp cc62
1347                         cc63:
1348 c9f2 f6 70 08            ldb  o
1349 c9f5 1d                  sex
1350 c9f6 34 06               pshs d
1351 c9f8 cc 00 01            ldd  #1
1352 c9fb a4 e0               anda ,s+
1353 c9fd e4 e0               andb ,s+
1354 c9ff 34 06               pshs d
1355 ca01 cc 00 00            ldd  #0
1356 ca04 10 a3 e1            cmpd ,s++
1357 ca07 27 05               beq  *+7
1358 ca09 cc 00 00            ldd  #0
1359 ca0c 20 03               bra  *+5
1360 ca0e cc 00 01            ldd  #1
1361 ca11 10 83 00 00         cmpd #0
1362 ca15 10 27 00 0a         lbeq cc64
1363 ca19 f6 70 07            ldb  q
1364 ca1c 1d                  sex
1365 ca1d f7 70 09            stb  key
1366 ca20 7e ca 30            jmp cc65
1367                         cc64:
1368 ca23 f6 70 07            ldb  q
1369 ca26 1d                  sex
1370 ca27 c3 00 01            addd #1
1371 ca2a f7 70 07            stb  q
1372 ca2d 83 00 01            subd #1
1373                         cc65:
1374 ca30 f6 70 08            ldb  o
1375 ca33 1d                  sex
1376 ca34 34 06               pshs d
1377 ca36 cc 00 01            ldd  #1
1378 ca39 5a                  decb
1379 ca3a 2d 06               blt  *+8
1380 ca3c 64 e4               lsr  ,s
1381 ca3e 66 61               ror  1,s
1382 ca40 20 f7               bra *-7
1383 ca42 35 06               puls d
1384 ca44 f7 70 08            stb  o
1385 ca47 7e c9 e2            jmp cc60
1386                         cc61:
1387 ca4a f6 70 05            ldb  k
1388 ca4d 1d                  sex
1389 ca4e 34 06               pshs d
1390 ca50 cc 00 01            ldd  #1
1391 ca53 5a                  decb
1392 ca54 2d 06               blt  *+8
1393 ca56 68 61               asl  1,s
1394 ca58 69 e4               rol  ,s
1395 ca5a 20 f7               bra  *-7
1396 ca5c 35 06               puls d
1397 ca5e f7 70 05            stb  k
1398 ca61 7e c8 c9            jmp cc52
```

```
1399                         cc53:
1400 ca64 fc 70 44            ldd  port0
1401 ca67 34 06               pshs d
1402 ca69 e6 f1               ldb  [,s++]
1403 ca6b 1d                  sex
1404 ca6c f7 70 08            stb  o
1405 ca6f f6 70 08            ldb  o
1406 ca72 1d                  sex
1407 ca73 34 06               pshs d
1408 ca75 cc 00 40            ldd  #64
1409 ca78 a4 e0               anda ,s+
1410 ca7a e4 e0               andb ,s+
1411 ca7c 34 06               pshs d
1412 ca7e cc 00 00            ldd  #0
1413 ca81 10 a3 e1            cmpd ,s++
1414 ca84 27 05               beq  *+7
1415 ca86 cc 00 00            ldd  #0
1416 ca89 20 03               bra  *+5
1417 ca8b cc 00 01            ldd  #1
1418 ca8e 10 83 00 00         cmpd #0
1419 ca92 10 27 00 06         lbeq cc66
1420 ca96 cc 00 24            ldd  #36
1421 ca99 f7 70 09            stb  key
1422                         cc66:
1423 ca9c 31 e4               leay 0,s
1424 ca9e 1f 20               tfr  y,d
1425 caa0 34 06               pshs d
1426 caa2 f6 70 09            ldb  key
1427 caa5 1d                  sex
1428 caa6 e7 f1               stb  [,s++]
1429 caa8 31 e4               leay 0,s
1430 caaa 1f 20               tfr  y,d
1431 caac 34 06               pshs d
1432 caae e6 f1               ldb  [,s++]
1433 cab0 1d                  sex
1434 cab1 32 61               leas 1,s
1435 cab3 39                  rts
1436
1437                         * .global dot_addr
1438                         dot_addr:
1439 cab4 cc 70 38            ldd  #buffer
1440 cab7 34 06               pshs d
1441 cab9 cc 00 00            ldd  #0
1442 cabc e3 e1               addd ,s++
1443 cabe 34 06               pshs d
1444 cac0 cc 70 38            ldd  #buffer
1445 cac3 34 06               pshs d
1446 cac5 cc 00 00            ldd  #0
1447 cac8 e3 e1               addd ,s++
1448 caca 34 06               pshs d
1449 cacc e6 f1               ldb  [,s++]
1450 cace 1d                  sex
1451 cacf 34 06               pshs d
1452 cad1 cc 00 40            ldd  #64
1453 cad4 43                  coma
1454 cad5 53                  comb
```

```
1455 cad6 a4 e0               anda ,s+
1456 cad8 e4 e0               andb ,s+
1457 cada e7 f1               stb  [,s++]
1458 cadc cc 70 38            ldd  #buffer
1459 cadf 34 06               pshs d
1460 cae1 cc 00 01            ldd  #1
1461 cae4 e3 e1               addd ,s++
1462 cae6 34 06               pshs d
1463 cae8 cc 70 38            ldd  #buffer
1464 caeb 34 06               pshs d
1465 caed cc 00 01            ldd  #1
1466 caf0 e3 e1               addd ,s++
1467 caf2 34 06               pshs d
1468 caf4 e6 f1               ldb  [,s++]
1469 caf6 1d                  sex
1470 caf7 34 06               pshs d
1471 caf9 cc 00 40            ldd  #64
1472 cafc 43                  coma
1473 cafd 53                  comb
1474 cafe a4 e0               anda ,s+
1475 cb00 e4 e0               andb ,s+
1476 cb02 e7 f1               stb  [,s++]
1477 cb04 cc 70 38            ldd  #buffer
1478 cb07 34 06               pshs d
1479 cb09 cc 00 02            ldd  #2
1480 cb0c e3 e1               addd ,s++
1481 cb0e 34 06               pshs d
1482 cb10 cc 70 38            ldd  #buffer
1483 cb13 34 06               pshs d
1484 cb15 cc 00 02            ldd  #2
1485 cb18 e3 e1               addd ,s++
1486 cb1a 34 06               pshs d
1487 cb1c e6 f1               ldb  [,s++]
1488 cb1e 1d                  sex
1489 cb1f 34 06               pshs d
1490 cb21 cc 00 40            ldd  #64
1491 cb24 aa e0               ora  ,s+
1492 cb26 ea e0               orb  ,s+
1493 cb28 e7 f1               stb  [,s++]
1494 cb2a cc 70 38            ldd  #buffer
1495 cb2d 34 06               pshs d
1496 cb2f cc 00 03            ldd  #3
1497 cb32 e3 e1               addd ,s++
1498 cb34 34 06               pshs d
1499 cb36 cc 70 38            ldd  #buffer
1500 cb39 34 06               pshs d
1501 cb3b cc 00 03            ldd  #3
1502 cb3e e3 e1               addd ,s++
1503 cb40 34 06               pshs d
1504 cb42 e6 f1               ldb  [,s++]
1505 cb44 1d                  sex
1506 cb45 34 06               pshs d
1507 cb47 cc 00 40            ldd  #64
1508 cb4a aa e0               ora  ,s+
1509 cb4c ea e0               orb  ,s+
1510 cb4e e7 f1               stb  [,s++]
```

```
1511 cb50 cc 70 38            ldd  #buffer
1512 cb53 34 06               pshs d
1513 cb55 cc 00 04            ldd  #4
1514 cb58 e3 e1               addd ,s++
1515 cb5a 34 06               pshs d
1516 cb5c cc 70 38            ldd  #buffer
1517 cb5f 34 06               pshs d
1518 cb61 cc 00 04            ldd  #4
1519 cb64 e3 e1               addd ,s++
1520 cb66 34 06               pshs d
1521 cb68 e6 f1               ldb  [,s++]
1522 cb6a 1d                  sex
1523 cb6b 34 06               pshs d
1524 cb6d cc 00 40            ldd  #64
1525 cb70 aa e0               ora  ,s+
1526 cb72 ea e0               orb  ,s+
1527 cb74 e7 f1               stb  [,s++]
1528 cb76 cc 70 38            ldd  #buffer
1529 cb79 34 06               pshs d
1530 cb7b cc 00 05            ldd  #5
1531 cb7e e3 e1               addd ,s++
1532 cb80 34 06               pshs d
1533 cb82 cc 70 38            ldd  #buffer
1534 cb85 34 06               pshs d
1535 cb87 cc 00 05            ldd  #5
1536 cb8a e3 e1               addd ,s++
1537 cb8c 34 06               pshs d
1538 cb8e e6 f1               ldb  [,s++]
1539 cb90 1d                  sex
1540 cb91 34 06               pshs d
1541 cb93 cc 00 40            ldd  #64
1542 cb96 aa e0               ora  ,s+
1543 cb98 ea e0               orb  ,s+
1544 cb9a e7 f1               stb  [,s++]
1545 cb9c 39                  rts
1546
1547                         * .global dot_data
1548                         dot_data:
1549 cb9d cc 70 38            ldd  #buffer
1550 cba0 34 06               pshs d
1551 cba2 cc 00 00            ldd  #0
1552 cba5 e3 e1               addd ,s++
1553 cba7 34 06               pshs d
1554 cba9 cc 70 38            ldd  #buffer
1555 cbac 34 06               pshs d
1556 cbae cc 00 00            ldd  #0
1557 cbb1 e3 e1               addd ,s++
1558 cbb3 34 06               pshs d
1559 cbb5 e6 f1               ldb  [,s++]
1560 cbb7 1d                  sex
1561 cbb8 34 06               pshs d
1562 cbba cc 00 40            ldd  #64
1563 cbbd aa e0               ora  ,s+
1564 cbbf ea e0               orb  ,s+
1565 cbc1 e7 f1               stb  [,s++]
1566 cbc3 cc 70 38            ldd  #buffer
```

```
1567 cbc6 34 06               pshs d
1568 cbc8 cc 00 01            ldd  #1
1569 cbcb e3 e1               addd ,s++
1570 cbcd 34 06               pshs d
1571 cbcf cc 70 38            ldd  #buffer
1572 cbd2 34 06               pshs d
1573 cbd4 cc 00 01            ldd  #1
1574 cbd7 e3 e1               addd ,s++
1575 cbd9 34 06               pshs d
1576 cbdb e6 f1               ldb  [,s++]
1577 cbdd 1d                  sex
1578 cbde 34 06               pshs d
1579 cbe0 cc 00 40            ldd  #64
1580 cbe3 aa e0               ora  ,s+
1581 cbe5 ea e0               orb  ,s+
1582 cbe7 e7 f1               stb  [,s++]
1583 cbe9 cc 70 38            ldd  #buffer
1584 cbec 34 06               pshs d
1585 cbee cc 00 02            ldd  #2
1586 cbf1 e3 e1               addd ,s++
1587 cbf3 34 06               pshs d
1588 cbf5 cc 70 38            ldd  #buffer
1589 cbf8 34 06               pshs d
1590 cbfa cc 00 02            ldd  #2
1591 cbfd e3 e1               addd ,s++
1592 cbff 34 06               pshs d
1593 cc01 e6 f1               ldb  [,s++]
1594 cc03 1d                  sex
1595 cc04 34 06               pshs d
1596 cc06 cc 00 40            ldd  #64
1597 cc09 43                  coma
1598 cc0a 53                  comb
1599 cc0b a4 e0               anda ,s+
1600 cc0d e4 e0               andb ,s+
1601 cc0f e7 f1               stb  [,s++]
1602 cc11 cc 70 38            ldd  #buffer
1603 cc14 34 06               pshs d
1604 cc16 cc 00 03            ldd  #3
1605 cc19 e3 e1               addd ,s++
1606 cc1b 34 06               pshs d
1607 cc1d cc 70 38            ldd  #buffer
1608 cc20 34 06               pshs d
1609 cc22 cc 00 03            ldd  #3
1610 cc25 e3 e1               addd ,s++
1611 cc27 34 06               pshs d
1612 cc29 e6 f1               ldb  [,s++]
1613 cc2b 1d                  sex
1614 cc2c 34 06               pshs d
1615 cc2e cc 00 40            ldd  #64
1616 cc31 43                  coma
1617 cc32 53                  comb
1618 cc33 a4 e0               anda ,s+
1619 cc35 e4 e0               andb ,s+
1620 cc37 e7 f1               stb  [,s++]
1621 cc39 cc 70 38            ldd  #buffer
1622 cc3c 34 06               pshs d
```

```
1623 cc3e cc 00 04            ldd  #4
1624 cc41 e3 e1               addd ,s++
1625 cc43 34 06               pshs d
1626 cc45 cc 70 38            ldd  #buffer
1627 cc48 34 06               pshs d
1628 cc4a cc 00 04            ldd  #4
1629 cc4d e3 e1               addd ,s++
1630 cc4f 34 06               pshs d
1631 cc51 e6 f1               ldb  [,s++]
1632 cc53 1d                  sex
1633 cc54 34 06               pshs d
1634 cc56 cc 00 40            ldd  #64
1635 cc59 43                  coma
1636 cc5a 53                  comb
1637 cc5b a4 e0               anda ,s+
1638 cc5d e4 e0               andb ,s+
1639 cc5f e7 f1               stb  [,s++]
1640 cc61 cc 70 38            ldd  #buffer
1641 cc64 34 06               pshs d
1642 cc66 cc 00 05            ldd  #5
1643 cc69 e3 e1               addd ,s++
1644 cc6b 34 06               pshs d
1645 cc6d cc 70 38            ldd  #buffer
1646 cc70 34 06               pshs d
1647 cc72 cc 00 05            ldd  #5
1648 cc75 e3 e1               addd ,s++
1649 cc77 34 06               pshs d
1650 cc79 e6 f1               ldb  [,s++]
1651 cc7b 1d                  sex
1652 cc7c 34 06               pshs d
1653 cc7e cc 00 40            ldd  #64
1654 cc81 43                  coma
1655 cc82 53                  comb
1656 cc83 a4 e0               anda ,s+
1657 cc85 e4 e0               andb ,s+
1658 cc87 e7 f1               stb  [,s++]
1659 cc89 39                  rts
1660
1661                         * .global hex4
1662                         hex4:
1663 cc8a 31 62               leay 2,s
1664 cc8c 1f 20               tfr  y,d
1665 cc8e 34 06               pshs d
1666 cc90 ec f1               ldd  [,s++]
1667 cc92 fd 70 17            std  temp16
1668 cc95 cc 70 38            ldd  #buffer
1669 cc98 34 06               pshs d
1670 cc9a cc 00 02            ldd  #2
1671 cc9d e3 e1               addd ,s++
1672 cc9f 34 06               pshs d
1673 cca1 cc c1 0d            ldd  #convert
1674 cca4 34 06               pshs d
1675 cca6 fc 70 17            ldd  temp16
1676 cca9 34 06               pshs d
1677 ccab cc 00 0f            ldd  #15
1678 ccae a4 e0               anda ,s+
1679 ccb0 e4 e0               andb ,s+
1680 ccb2 e3 e1               addd ,s++
1681 ccb4 34 06               pshs d
1682 ccb6 e6 f1               ldb  [,s++]
1683 ccb8 1d                  sex
1684 ccb9 e7 f1               stb  [,s++]
1685 ccbb cc 70 17            ldd  #temp16
1686 ccbe 34 06               pshs d
1687 ccc0 cc 00 04            ldd  #4
1688 ccc3 ae f4               ldx  [,s]
1689 ccc5 34 10               pshs x
1690 ccc7 5a                  decb
1691 ccc8 2d 06               blt  *+8
1692 ccca 64 e4               lsr  ,s
1693 cccc 66 61               ror  1,s
1694 ccce 20 f7               bra *-7
1695 ccd0 35 06               puls d
1696 ccd2 fd 70 17            std  temp16
1697 ccd5 cc 70 38            ldd  #buffer
1698 ccd8 34 06               pshs d
1699 ccda cc 00 03            ldd  #3
1700 ccdd e3 e1               addd ,s++
1701 ccdf 34 06               pshs d
1702 cce1 cc c1 0d            ldd  #convert
1703 cce4 34 06               pshs d
1704 cce6 fc 70 17            ldd  temp16
1705 cce9 34 06               pshs d
1706 cceb cc 00 0f            ldd  #15
1707 ccee a4 e0               anda ,s+
1708 ccf0 e4 e0               andb ,s+
1709 ccf2 e3 e1               addd ,s++
1710 ccf4 34 06               pshs d
1711 ccf6 e6 f1               ldb  [,s++]
1712 ccf8 1d                  sex
1713 ccf9 e7 f1               stb  [,s++]
1714 ccfb cc 70 17            ldd  #temp16
1715 ccfe 34 06               pshs d
1716 cd00 cc 00 04            ldd  #4
1717 cd03 ae f4               ldx  [,s]
1718 cd05 34 10               pshs x
1719 cd07 5a                  decb
1720 cd08 2d 06               blt  *+8
1721 cd0a 64 e4               lsr  ,s
1722 cd0c 66 61               ror  1,s
1723 cd0e 20 f7               bra *-7
1724 cd10 35 06               puls d
1725 cd12 fd 70 17            std  temp16
1726 cd15 cc 70 38            ldd  #buffer
1727 cd18 34 06               pshs d
1728 cd1a cc 00 04            ldd  #4
1729 cd1d e3 e1               addd ,s++
1730 cd1f 34 06               pshs d
1731 cd21 cc c1 0d            ldd  #convert
1732 cd24 34 06               pshs d
1733 cd26 fc 70 17            ldd  temp16
1734 cd29 34 06               pshs d
```

```
1735 cd2b cc 00 0f            ldd  #15
1736 cd2e a4 e0               anda ,s+
1737 cd30 e4 e0               andb ,s+
1738 cd32 e3 e1               addd ,s++
1739 cd34 34 06               pshs d
1740 cd36 e6 f1               ldb  [,s++]
1741 cd38 1d                  sex
1742 cd39 e7 f1               stb  [,s++]
1743 cd3b cc 70 17            ldd  #temp16
1744 cd3e 34 06               pshs d
1745 cd40 cc 00 04            ldd  #4
1746 cd43 ae f4               ldx  [,s]
1747 cd45 34 10               pshs x
1748 cd47 5a                  decb
1749 cd48 2d 06               blt  *+8
1750 cd4a 64 e4               lsr  ,s
1751 cd4c 66 61               ror  1,s
1752 cd4e 20 f7               bra *-7
1753 cd50 35 06               puls d
1754 cd52 fd 70 17            std  temp16
1755 cd55 cc 70 38            ldd  #buffer
1756 cd58 34 06               pshs d
1757 cd5a cc 00 05            ldd  #5
1758 cd5d e3 e1               addd ,s++
1759 cd5f 34 06               pshs d
1760 cd61 cc c1 0d            ldd  #convert
1761 cd64 34 06               pshs d
1762 cd66 fc 70 17            ldd  temp16
1763 cd69 34 06               pshs d
1764 cd6b cc 00 0f            ldd  #15
1765 cd6e a4 e0               anda ,s+
1766 cd70 e4 e0               andb ,s+
1767 cd72 e3 e1               addd ,s++
1768 cd74 34 06               pshs d
1769 cd76 e6 f1               ldb  [,s++]
1770 cd78 1d                  sex
1771 cd79 e7 f1               stb  [,s++]
1772 cd7b 32 66               leas 6,s
1773 cd7d 39                  rts
1774
1775                         * .global address_
1776                         address_:
1777 cd7e fc 70 19            ldd  PC
1778 cd81 fd 70 17            std  temp16
1779 cd84 fc 70 17            ldd  temp16
1780 cd87 34 06               pshs d
1781 cd89 bd cc 8a            jsr hex4
1782 cd8c 32 62               leas 2,s
1783 cd8e 39                  rts
1784
1785                         * .global data_dis
1786                         data_dis:
1787 cd8f fc 70 19            ldd  PC
1788 cd92 fd 70 46            std  dptr
1789 cd95 fc 70 46            ldd  dptr
1790 cd98 34 06               pshs d
```

```
1791 cd9a e6 f1                ldb  [,s++]
1792 cd9c 1d                   sex
1793 cd9d f7 70 04             stb  n
1794 cda0 cc 70 38             ldd  #buffer
1795 cda3 34 06                pshs d
1796 cda5 cc 00 00             ldd  #0
1797 cda8 e3 e1                addd ,s++
1798 cdaa 34 06                pshs d
1799 cdac cc c1 0d             ldd  #convert
1800 cdaf 34 06                pshs d
1801 cdb1 f6 70 04             ldb  n
1802 cdb4 1d                   sex
1803 cdb5 34 06                pshs d
1804 cdb7 cc 00 0f             ldd  #15
1805 cdba a4 e0                anda ,s+
1806 cdbc e4 e0                andb ,s+
1807 cdbe e3 e1                addd ,s++
1808 cdc0 34 06                pshs d
1809 cdc2 e6 f1                ldb  [,s++]
1810 cdc4 1d                   sex
1811 cdc5 e7 f1                stb  [,s++]
1812 cdc7 f6 70 04             ldb  n
1813 cdca 1d                   sex
1814 cdcb 34 06                pshs d
1815 cdcd cc 00 04             ldd  #4
1816 cdd0 5a                   decb
1817 cdd1 2d 06                blt  *+8
1818 cdd3 64 e4                lsr  ,s
1819 cdd5 66 61                ror  1,s
1820 cdd7 20 f7                bra *-7
1821 cdd9 35 06                puls d
1822 cddb f7 70 04             stb  n
1823 cdde cc 70 38             ldd  #buffer
1824 cde1 34 06                pshs d
1825 cde3 cc 00 01             ldd  #1
1826 cde6 e3 e1                addd ,s++
1827 cde8 34 06                pshs d
1828 cdea cc c1 0d             ldd  #convert
1829 cded 34 06                pshs d
1830 cdef f6 70 04             ldb  n
1831 cdf2 1d                   sex
1832 cdf3 34 06                pshs d
1833 cdf5 cc 00 0f             ldd  #15
1834 cdf8 a4 e0                anda ,s+
1835 cdfa e4 e0                andb ,s+
1836 cdfc e3 e1                addd ,s++
1837 cdfe 34 06                pshs d
1838 ce00 e6 f1                ldb  [,s++]
1839 ce02 1d                   sex
1840 ce03 e7 f1                stb  [,s++]
1841 ce05 bd cb 9d             jsr dot_data
1842 ce08 39                   rts
1843
1844                          * .global read_mem
1845                          read_mem:
1846 ce09 bd cd 7e             jsr address_
```

```
1847 ce0c bd cd 8f            jsr data_dis
1848 ce0f 39                  rts
1849
1850                         * .global key_addr
1851                         key_addr:
1852 ce10 cc 00 01            ldd  #1
1853 ce13 f7 70 27            stb  state
1854 ce16 bd ce 09            jsr read_mem
1855 ce19 bd ca b4            jsr dot_addr
1856 ce1c cc 00 00            ldd  #0
1857 ce1f f7 70 0b            stb  hit
1858 ce22 39                  rts
1859
1860                         * .global key_data
1861                         key_data:
1862 ce23 bd ce 09            jsr read_mem
1863 ce26 bd cb 9d            jsr dot_data
1864 ce29 cc 00 00            ldd  #0
1865 ce2c f7 70 0b            stb  hit
1866 ce2f cc 00 02            ldd  #2
1867 ce32 f7 70 27            stb  state
1868 ce35 39                  rts
1869
1870                         * .global key_plus
1871                         key_plus:
1872 ce36 f6 70 27            ldb  state
1873 ce39 1d                  sex
1874 ce3a 34 06               pshs d
1875 ce3c cc 00 01            ldd  #1
1876 ce3f 10 a3 e1            cmpd ,s++
1877 ce42 27 05               beq  *+7
1878 ce44 cc 00 00            ldd  #0
1879 ce47 20 03               bra  *+5
1880 ce49 cc 00 01            ldd  #1
1881 ce4c 10 83 00 00         cmpd #0
1882 ce50 10 26 00 24         lbne cc68
1883 ce54 f6 70 27            ldb  state
1884 ce57 1d                  sex
1885 ce58 34 06               pshs d
1886 ce5a cc 00 02            ldd  #2
1887 ce5d 10 a3 e1            cmpd ,s++
1888 ce60 27 05               beq  *+7
1889 ce62 cc 00 00            ldd  #0
1890 ce65 20 03               bra  *+5
1891 ce67 cc 00 01            ldd  #1
1892 ce6a 10 83 00 00         cmpd #0
1893 ce6e 10 26 00 06         lbne cc68
1894 ce72 cc 00 00            ldd  #0
1895 ce75 7e ce 7b            jmp cc69
1896                         cc68:
1897 ce78 cc 00 01            ldd  #1
1898                         cc69:
1899 ce7b 10 83 00 00         cmpd #0
1900 ce7f 10 27 00 12         lbeq cc67
1901 ce83 fc 70 19            ldd  PC
1902 ce86 c3 00 01            addd #1
```

```
1903 ce89 fd 70 19            std  PC
1904 ce8c 83 00 01            subd #1
1905 ce8f bd ce 09            jsr read_mem
1906 ce92 bd ce 23            jsr key_data
1907                         cc67:
1908 ce95 f6 70 27            ldb  state
1909 ce98 1d                  sex
1910 ce99 34 06               pshs d
1911 ce9b cc 00 04            ldd  #4
1912 ce9e 10 a3 e1            cmpd ,s++
1913 cea1 27 05               beq  *+7
1914 cea3 cc 00 00            ldd  #0
1915 cea6 20 03               bra  *+5
1916 cea8 cc 00 01            ldd  #1
1917 ceab 10 83 00 00         cmpd #0
1918 ceaf 10 27 00 12         lbeq cc70
1919 ceb3 fc 70 1d            ldd  num
1920 ceb6 fd 70 1f            std  start
1921 ceb9 cc 00 00            ldd  #0
1922 cebc f7 70 0b            stb  hit
1923 cebf cc 00 01            ldd  #1
1924 cec2 f7 70 0c            stb  positive
1925                         cc70:
1926 cec5 f6 70 27            ldb  state
1927 cec8 1d                  sex
1928 cec9 34 06               pshs d
1929 cecb cc 00 05            ldd  #5
1930 cece 10 a3 e1            cmpd ,s++
1931 ced1 27 05               beq  *+7
1932 ced3 cc 00 00            ldd  #0
1933 ced6 20 03               bra  *+5
1934 ced8 cc 00 01            ldd  #1
1935 cedb 10 83 00 00         cmpd #0
1936 cedf 10 27 00 24         lbeq cc71
1937 cee3 cc 00 06            ldd  #6
1938 cee6 f7 70 27            stb  state
1939 cee9 fc 70 1d            ldd  num
1940 ceec fd 70 1f            std  start
1941 ceef cc 00 00            ldd  #0
1942 cef2 f7 70 0b            stb  hit
1943 cef5 cc 70 38            ldd  #buffer
1944 cef8 34 06               pshs d
1945 cefa cc 00 00            ldd  #0
1946 cefd e3 e1               addd ,s++
1947 ceff 34 06               pshs d
1948 cf01 cc 00 8f            ldd  #143
1949 cf04 e7 f1               stb  [,s++]
1950 cf06 39                  rts
1951                         cc71:
1952 cf07 f6 70 27            ldb  state
1953 cf0a 1d                  sex
1954 cf0b 34 06               pshs d
1955 cf0d cc 00 06            ldd  #6
1956 cf10 10 a3 e1            cmpd ,s++
1957 cf13 27 05               beq  *+7
1958 cf15 cc 00 00            ldd  #0
```

```
1959 cf18 20 03               bra  *+5
1960 cf1a cc 00 01            ldd  #1
1961 cf1d 10 83 00 00         cmpd #0
1962 cf21 10 27 00 43         lbeq cc72
1963 cf25 cc 00 07            ldd  #7
1964 cf28 f7 70 27            stb  state
1965 cf2b fc 70 1d            ldd  num
1966 cf2e fd 70 21            std  end
1967 cf31 cc 00 00            ldd  #0
1968 cf34 f7 70 0b            stb  hit
1969 cf37 cc 70 38            ldd  #buffer
1970 cf3a 34 06               pshs d
1971 cf3c cc 00 00            ldd  #0
1972 cf3f e3 e1               addd ,s++
1973 cf41 34 06               pshs d
1974 cf43 cc 00 b3            ldd  #179
1975 cf46 e7 f1               stb  [,s++]
1976 cf48 fc 70 21            ldd  end
1977 cf4b 34 06               pshs d
1978 cf4d fc 70 1f            ldd  start
1979 cf50 10 a3 e1            cmpd ,s++
1980 cf53 2c 05               bge  *+7
1981 cf55 cc 00 00            ldd  #0
1982 cf58 20 03               bra  *+5
1983 cf5a cc 00 01            ldd  #1
1984 cf5d 10 83 00 00         cmpd #0
1985 cf61 10 27 00 03         lbeq cc73
1986 cf65 bd d0 c6            jsr print_er
1987                         cc73:
1988                         cc72:
1989 cf68 39                  rts
1990
1991                         * .global key_minu
1992                         key_minu:
1993 cf69 f6 70 27            ldb  state
1994 cf6c 1d                  sex
1995 cf6d 34 06               pshs d
1996 cf6f cc 00 01            ldd  #1
1997 cf72 10 a3 e1            cmpd ,s++
1998 cf75 27 05               beq  *+7
1999 cf77 cc 00 00            ldd  #0
2000 cf7a 20 03               bra  *+5
2001 cf7c cc 00 01            ldd  #1
2002 cf7f 34 06               pshs d
2003 cf81 f6 70 27            ldb  state
2004 cf84 1d                  sex
2005 cf85 34 06               pshs d
2006 cf87 cc 00 02            ldd  #2
2007 cf8a 10 a3 e1            cmpd ,s++
2008 cf8d 27 05               beq  *+7
2009 cf8f cc 00 00            ldd  #0
2010 cf92 20 03               bra  *+5
2011 cf94 cc 00 01            ldd  #1
2012 cf97 aa e0               ora  ,s+
2013 cf99 ea e0               orb  ,s+
2014 cf9b 10 83 00 00         cmpd #0
```

```
2015 cf9f 10 27 00 12          lbeq cc74
2016 cfa3 fc 70 19             ldd  PC
2017 cfa6 83 00 01             subd #1
2018 cfa9 fd 70 19             std  PC
2019 cfac c3 00 01             addd #1
2020 cfaf bd ce 09             jsr read_mem
2021 cfb2 bd ce 23             jsr key_data
2022                          cc74:
2023 cfb5 f6 70 27             ldb  state
2024 cfb8 1d                   sex
2025 cfb9 34 06                pshs d
2026 cfbb cc 00 04             ldd  #4
2027 cfbe 10 a3 e1             cmpd ,s++
2028 cfc1 27 05                beq  *+7
2029 cfc3 cc 00 00             ldd  #0
2030 cfc6 20 03                bra  *+5
2031 cfc8 cc 00 01             ldd  #1
2032 cfcb 10 83 00 00          cmpd #0
2033 cfcf 10 27 00 12          lbeq cc75
2034 cfd3 fc 70 1d             ldd  num
2035 cfd6 fd 70 1f             std  start
2036 cfd9 cc 00 00             ldd  #0
2037 cfdc f7 70 0b             stb  hit
2038 cfdf cc 00 00             ldd  #0
2039 cfe2 f7 70 0c             stb  positive
2040                          cc75:
2041 cfe5 39                   rts
2042
2043                          * .global data_hex
2044                          data_hex:
2045 cfe6 fc 70 19             ldd  PC
2046 cfe9 fd 70 46             std  dptr
2047 cfec fc 70 46             ldd  dptr
2048 cfef 34 06                pshs d
2049 cff1 e6 f1                ldb  [,s++]
2050 cff3 1d                   sex
2051 cff4 f7 70 0a             stb  x
2052 cff7 f6 70 0b             ldb  hit
2053 cffa 1d                   sex
2054 cffb 34 06                pshs d
2055 cffd cc 00 00             ldd  #0
2056 d000 10 a3 e1             cmpd ,s++
2057 d003 27 05                beq  *+7
2058 d005 cc 00 00             ldd  #0
2059 d008 20 03                bra  *+5
2060 d00a cc 00 01             ldd  #1
2061 d00d 10 83 00 00          cmpd #0
2062 d011 10 27 00 06          lbeq cc76
2063 d015 cc 00 00             ldd  #0
2064 d018 f7 70 0a             stb  x
2065                          cc76:
2066 d01b cc 00 01             ldd  #1
2067 d01e f7 70 0b             stb  hit
2068 d021 f6 70 0a             ldb  x
2069 d024 1d                   sex
2070 d025 34 06                pshs d
```

```
2071 d027 cc 00 04            ldd  #4
2072 d02a 5a                  decb
2073 d02b 2d 06               blt  *+8
2074 d02d 68 61               asl  1,s
2075 d02f 69 e4               rol  ,s
2076 d031 20 f7               bra  *-7
2077 d033 35 06               puls d
2078 d035 f7 70 0a            stb  x
2079 d038 f6 70 0a            ldb  x
2080 d03b 1d                  sex
2081 d03c 34 06               pshs d
2082 d03e f6 70 09            ldb  key
2083 d041 1d                  sex
2084 d042 aa e0               ora  ,s+
2085 d044 ea e0               orb  ,s+
2086 d046 f7 70 0a            stb  x
2087 d049 fc 70 46            ldd  dptr
2088 d04c 34 06               pshs d
2089 d04e f6 70 0a            ldb  x
2090 d051 1d                  sex
2091 d052 e7 f1               stb  [,s++]
2092 d054 bd ce 09            jsr read_mem
2093 d057 bd cb 9d            jsr dot_data
2094 d05a 39                  rts
2095
2096                         * .global key_PC
2097                         key_PC:
2098 d05b fc 70 1b            ldd  save_PC
2099 d05e fd 70 19            std  PC
2100 d061 bd ce 23            jsr key_data
2101 d064 39                  rts
2102
2103                         * .global hex_addr
2104                         hex_addr:
2105 d065 f6 70 0b            ldb  hit
2106 d068 1d                  sex
2107 d069 34 06               pshs d
2108 d06b cc 00 00            ldd  #0
2109 d06e 10 a3 e1            cmpd ,s++
2110 d071 27 05               beq  *+7
2111 d073 cc 00 00            ldd  #0
2112 d076 20 03               bra  *+5
2113 d078 cc 00 01            ldd  #1
2114 d07b 10 83 00 00         cmpd #0
2115 d07f 10 27 00 06         lbeq cc77
2116 d083 cc 00 00            ldd  #0
2117 d086 fd 70 19            std  PC
2118                         cc77:
2119 d089 cc 00 01            ldd  #1
2120 d08c f7 70 0b            stb  hit
2121 d08f cc 70 19            ldd  #PC
2122 d092 34 06               pshs d
2123 d094 cc 00 04            ldd  #4
2124 d097 ae f4               ldx  [,s]
2125 d099 34 10               pshs x
2126 d09b 5a                  decb
```

```
2127 d09c 2d 06               blt  *+8
2128 d09e 68 61               asl  1,s
2129 d0a0 69 e4               rol  ,s
2130 d0a2 20 f7               bra  *-7
2131 d0a4 35 06               puls d
2132 d0a6 fd 70 19            std  PC
2133 d0a9 cc 70 19            ldd  #PC
2134 d0ac 34 06               pshs d
2135 d0ae f6 70 09            ldb  key
2136 d0b1 1d                  sex
2137 d0b2 ae f4               ldx  [,s]
2138 d0b4 34 10               pshs x
2139 d0b6 aa e0               ora  ,s+
2140 d0b8 ea e0               orb  ,s+
2141 d0ba fd 70 19            std  PC
2142 d0bd bd ce 09            jsr read_mem
2143 d0c0 bd ca b4            jsr dot_addr
2144 d0c3 32 64               leas 4,s
2145 d0c5 39                  rts
2146
2147                         * .global print_er
2148                         print_er:
2149 d0c6 cc 70 38            ldd  #buffer
2150 d0c9 34 06               pshs d
2151 d0cb cc 00 05            ldd  #5
2152 d0ce e3 e1               addd ,s++
2153 d0d0 34 06               pshs d
2154 d0d2 cc 00 8f            ldd  #143
2155 d0d5 e7 f1               stb  [,s++]
2156 d0d7 cc 70 38            ldd  #buffer
2157 d0da 34 06               pshs d
2158 d0dc cc 00 04            ldd  #4
2159 d0df e3 e1               addd ,s++
2160 d0e1 34 06               pshs d
2161 d0e3 cc 00 03            ldd  #3
2162 d0e6 e7 f1               stb  [,s++]
2163 d0e8 cc 70 38            ldd  #buffer
2164 d0eb 34 06               pshs d
2165 d0ed cc 00 03            ldd  #3
2166 d0f0 e3 e1               addd ,s++
2167 d0f2 34 06               pshs d
2168 d0f4 cc 00 03            ldd  #3
2169 d0f7 e7 f1               stb  [,s++]
2170 d0f9 cc 70 38            ldd  #buffer
2171 d0fc 34 06               pshs d
2172 d0fe cc 00 02            ldd  #2
2173 d101 e3 e1               addd ,s++
2174 d103 34 06               pshs d
2175 d105 cc 00 00            ldd  #0
2176 d108 e7 f1               stb  [,s++]
2177 d10a cc 70 38            ldd  #buffer
2178 d10d 34 06               pshs d
2179 d10f cc 00 01            ldd  #1
2180 d112 e3 e1               addd ,s++
2181 d114 34 06               pshs d
2182 d116 cc 00 00            ldd  #0
```

```
2183 d119 e7 f1               stb  [,s++]
2184 d11b cc 70 38            ldd  #buffer
2185 d11e 34 06               pshs d
2186 d120 cc 00 00            ldd  #0
2187 d123 e3 e1               addd ,s++
2188 d125 34 06               pshs d
2189 d127 cc 00 00            ldd  #0
2190 d12a e7 f1               stb  [,s++]
2191 d12c cc 00 00            ldd  #0
2192 d12f f7 70 27            stb  state
2193 d132 39                  rts
2194
2195                         * .global key_go
2196                         key_go:
2197 d133 f6 70 27            ldb  state
2198 d136 1d                  sex
2199 d137 34 06               pshs d
2200 d139 cc 00 01            ldd  #1
2201 d13c 10 a3 e1            cmpd ,s++
2202 d13f 27 05               beq  *+7
2203 d141 cc 00 00            ldd  #0
2204 d144 20 03               bra  *+5
2205 d146 cc 00 01            ldd  #1
2206 d149 10 83 00 00         cmpd #0
2207 d14d 10 26 00 24         lbne cc79
2208 d151 f6 70 27            ldb  state
2209 d154 1d                  sex
2210 d155 34 06               pshs d
2211 d157 cc 00 02            ldd  #2
2212 d15a 10 a3 e1            cmpd ,s++
2213 d15d 27 05               beq  *+7
2214 d15f cc 00 00            ldd  #0
2215 d162 20 03               bra  *+5
2216 d164 cc 00 01            ldd  #1
2217 d167 10 83 00 00         cmpd #0
2218 d16b 10 26 00 06         lbne cc79
2219 d16f cc 00 00            ldd  #0
2220 d172 7e d1 78            jmp cc80
2221                         cc79:
2222 d175 cc 00 01            ldd  #1
2223                         cc80:
2224 d178 10 83 00 00         cmpd #0
2225 d17c 10 27 00 24         lbeq cc78
2226 d180 10 ff 70 2e           STS SAVE_SP
2227 d184 fe 70 2a              LDU USER_U
2228 d187 fc 70 19              LDD PC
2229 d18a 34 06                 PSHS D
2230 d18c b6 70 34              LDA USER_P
2231 d18f 1f 8a                 TFR A,CC
2232 d191 b6 70 35              LDA USER_DP
2233 d194 1f 8b                 TFR A,DP
2234 d196 be 70 2c              LDX USER_X
2235 d199 10 be 70 30           LDY USER_Y
2236 d19d f6 70 33              LDB USER_B
2237 d1a0 b6 70 32              LDA USER_A
2238 d1a3 39                    RTS
```

```
2239                         cc78:
2240 d1a4 f6 70 27            ldb  state
2241 d1a7 1d                  sex
2242 d1a8 34 06               pshs d
2243 d1aa cc 00 04            ldd  #4
2244 d1ad 10 a3 e1            cmpd ,s++
2245 d1b0 27 05               beq  *+7
2246 d1b2 cc 00 00            ldd  #0
2247 d1b5 20 03               bra  *+5
2248 d1b7 cc 00 01            ldd  #1
2249 d1ba 10 83 00 00         cmpd #0
2250 d1be 10 27 00 57         lbeq cc81
2251 d1c2 fc 70 1d            ldd  num
2252 d1c5 fd 70 23            std  desti
2253 d1c8 f6 70 0c            ldb  positive
2254 d1cb 1d                  sex
2255 d1cc 34 06               pshs d
2256 d1ce cc 00 00            ldd  #0
2257 d1d1 10 a3 e1            cmpd ,s++
2258 d1d4 27 05               beq  *+7
2259 d1d6 cc 00 00            ldd  #0
2260 d1d9 20 03               bra  *+5
2261 d1db cc 00 01            ldd  #1
2262 d1de 10 83 00 00         cmpd #0
2263 d1e2 10 27 00 16         lbeq cc82
2264 d1e6 fc 70 1f            ldd  start
2265 d1e9 34 06               pshs d
2266 d1eb fc 70 23            ldd  desti
2267 d1ee 35 10               puls x
2268 d1f0 34 06               pshs d
2269 d1f2 1f 10               tfr  x,d
2270 d1f4 a3 e1               subd ,s++
2271 d1f6 fd 70 1f            std  start
2272 d1f9 7e d2 09            jmp cc83
2273                         cc82:
2274 d1fc fc 70 1f            ldd  start
2275 d1ff 34 06               pshs d
2276 d201 fc 70 23            ldd  desti
2277 d204 e3 e1               addd ,s++
2278 d206 fd 70 1f            std  start
2279                         cc83:
2280 d209 fc 70 1f            ldd  start
2281 d20c 34 06               pshs d
2282 d20e bd cc 8a            jsr hex4
2283 d211 32 62               leas 2,s
2284 d213 cc 00 00            ldd  #0
2285 d216 f7 70 0b            stb  hit
2286                         cc81:
2287 d219 f6 70 27            ldb  state
2288 d21c 1d                  sex
2289 d21d 34 06               pshs d
2290 d21f cc 00 07            ldd  #7
2291 d222 10 a3 e1            cmpd ,s++
2292 d225 27 05               beq  *+7
2293 d227 cc 00 00            ldd  #0
2294 d22a 20 03               bra  *+5
```

```
2295 d22c cc 00 01            ldd  #1
2296 d22f 10 83 00 00         cmpd #0
2297 d233 10 27 00 8c         lbeq cc84
2298 d237 fc 70 1d            ldd  num
2299 d23a fd 70 23            std  desti
2300 d23d fc 70 21            ldd  end
2301 d240 34 06               pshs d
2302 d242 fc 70 1f            ldd  start
2303 d245 35 10               puls x
2304 d247 34 06               pshs d
2305 d249 1f 10               tfr  x,d
2306 d24b a3 e1               subd ,s++
2307 d24d fd 70 15            std  temp
2308 d250 fc 70 1f            ldd  start
2309 d253 fd 70 46            std  dptr
2310 d256 fc 70 23            ldd  desti
2311 d259 fd 70 48            std  dptr2
2312 d25c cc 00 00            ldd  #0
2313 d25f fd 70 00            std  i
2314                         cc87:
2315 d262 fc 70 00            ldd  i
2316 d265 34 06               pshs d
2317 d267 fc 70 15            ldd  temp
2318 d26a 10 a3 e1            cmpd ,s++
2319 d26d 2e 05               bgt  *+7
2320 d26f cc 00 00            ldd  #0
2321 d272 20 03               bra  *+5
2322 d274 cc 00 01            ldd  #1
2323 d277 10 83 00 00         cmpd #0
2324 d27b 10 27 00 32         lbeq cc86
2325 d27f 7e d2 91            jmp cc88
2326                         cc85:
2327 d282 fc 70 00            ldd  i
2328 d285 c3 00 01            addd #1
2329 d288 fd 70 00            std  i
2330 d28b 83 00 01            subd #1
2331 d28e 7e d2 62            jmp cc87
2332                         cc88:
2333 d291 fc 70 48            ldd  dptr2
2334 d294 34 06               pshs d
2335 d296 fc 70 00            ldd  i
2336 d299 e3 e1               addd ,s++
2337 d29b 34 06               pshs d
2338 d29d fc 70 46            ldd  dptr
2339 d2a0 34 06               pshs d
2340 d2a2 fc 70 00            ldd  i
2341 d2a5 e3 e1               addd ,s++
2342 d2a7 34 06               pshs d
2343 d2a9 e6 f1               ldb  [,s++]
2344 d2ab 1d                  sex
2345 d2ac e7 f1               stb  [,s++]
2346 d2ae 7e d2 82            jmp cc85
2347                         cc86:
2348 d2b1 fc 70 23            ldd  desti
2349 d2b4 fd 70 19            std  PC
2350 d2b7 bd ce 09            jsr read_mem
```

```
2351 d2ba bd cb 9d            jsr dot_data
2352 d2bd cc 00 02            ldd  #2
2353 d2c0 f7 70 27            stb  state
2354                         cc84:
2355 d2c3 39                  rts
2356
2357                         * .global key_reg
2358                         key_reg:
2359 d2c4 cc 70 38            ldd  #buffer
2360 d2c7 34 06               pshs d
2361 d2c9 cc 00 07            ldd  #7
2362 d2cc e3 e1               addd ,s++
2363 d2ce 34 06               pshs d
2364 d2d0 cc 00 00            ldd  #0
2365 d2d3 e7 f1               stb  [,s++]
2366 d2d5 cc 70 38            ldd  #buffer
2367 d2d8 34 06               pshs d
2368 d2da cc 00 06            ldd  #6
2369 d2dd e3 e1               addd ,s++
2370 d2df 34 06               pshs d
2371 d2e1 cc 00 00            ldd  #0
2372 d2e4 e7 f1               stb  [,s++]
2373 d2e6 cc 70 38            ldd  #buffer
2374 d2e9 34 06               pshs d
2375 d2eb cc 00 05            ldd  #5
2376 d2ee e3 e1               addd ,s++
2377 d2f0 34 06               pshs d
2378 d2f2 cc 00 03            ldd  #3
2379 d2f5 e7 f1               stb  [,s++]
2380 d2f7 cc 70 38            ldd  #buffer
2381 d2fa 34 06               pshs d
2382 d2fc cc 00 04            ldd  #4
2383 d2ff e3 e1               addd ,s++
2384 d301 34 06               pshs d
2385 d303 cc 00 8f            ldd  #143
2386 d306 e7 f1               stb  [,s++]
2387 d308 cc 70 38            ldd  #buffer
2388 d30b 34 06               pshs d
2389 d30d cc 00 03            ldd  #3
2390 d310 e3 e1               addd ,s++
2391 d312 34 06               pshs d
2392 d314 cc 00 ad            ldd  #173
2393 d317 e7 f1               stb  [,s++]
2394 d319 cc 70 38            ldd  #buffer
2395 d31c 34 06               pshs d
2396 d31e cc 00 02            ldd  #2
2397 d321 e3 e1               addd ,s++
2398 d323 34 06               pshs d
2399 d325 cc 00 00            ldd  #0
2400 d328 e7 f1               stb  [,s++]
2401 d32a cc 70 38            ldd  #buffer
2402 d32d 34 06               pshs d
2403 d32f cc 00 01            ldd  #1
2404 d332 e3 e1               addd ,s++
2405 d334 34 06               pshs d
2406 d336 cc 00 00            ldd  #0
```

```
2407 d339 e7 f1                stb  [,s++]
2408 d33b cc 70 38             ldd  #buffer
2409 d33e 34 06                pshs d
2410 d340 cc 00 00             ldd  #0
2411 d343 e3 e1                addd ,s++
2412 d345 34 06                pshs d
2413 d347 cc 00 00             ldd  #0
2414 d34a e7 f1                stb  [,s++]
2415 d34c cc 00 03             ldd  #3
2416 d34f f7 70 27             stb  state
2417 d352 39                   rts
2418
2419                          * .global acca
2420                          acca:
2421 d353 f6 70 32             ldb  USER_A
2422 d356 1d                   sex
2423 d357 f7 70 04             stb  n
2424 d35a cc 70 38             ldd  #buffer
2425 d35d 34 06                pshs d
2426 d35f cc 00 02             ldd  #2
2427 d362 e3 e1                addd ,s++
2428 d364 34 06                pshs d
2429 d366 cc c1 0d             ldd  #convert
2430 d369 34 06                pshs d
2431 d36b f6 70 04             ldb  n
2432 d36e 1d                   sex
2433 d36f 34 06                pshs d
2434 d371 cc 00 0f             ldd  #15
2435 d374 a4 e0                anda ,s+
2436 d376 e4 e0                andb ,s+
2437 d378 e3 e1                addd ,s++
2438 d37a 34 06                pshs d
2439 d37c e6 f1                ldb  [,s++]
2440 d37e 1d                   sex
2441 d37f e7 f1                stb  [,s++]
2442 d381 f6 70 04             ldb  n
2443 d384 1d                   sex
2444 d385 34 06                pshs d
2445 d387 cc 00 04             ldd  #4
2446 d38a 5a                   decb
2447 d38b 2d 06                blt  *+8
2448 d38d 64 e4                lsr  ,s
2449 d38f 66 61                ror  1,s
2450 d391 20 f7                bra *-7
2451 d393 35 06                puls d
2452 d395 f7 70 04             stb  n
2453 d398 cc 70 38             ldd  #buffer
2454 d39b 34 06                pshs d
2455 d39d cc 00 03             ldd  #3
2456 d3a0 e3 e1                addd ,s++
2457 d3a2 34 06                pshs d
2458 d3a4 cc c1 0d             ldd  #convert
2459 d3a7 34 06                pshs d
2460 d3a9 f6 70 04             ldb  n
2461 d3ac 1d                   sex
2462 d3ad 34 06                pshs d
```

```
2463 d3af cc 00 0f            ldd  #15
2464 d3b2 a4 e0               anda ,s+
2465 d3b4 e4 e0               andb ,s+
2466 d3b6 e3 e1               addd ,s++
2467 d3b8 34 06               pshs d
2468 d3ba e6 f1               ldb  [,s++]
2469 d3bc 1d                  sex
2470 d3bd e7 f1               stb  [,s++]
2471 d3bf cc 70 38            ldd  #buffer
2472 d3c2 34 06               pshs d
2473 d3c4 cc 00 04            ldd  #4
2474 d3c7 e3 e1               addd ,s++
2475 d3c9 34 06               pshs d
2476 d3cb cc 00 00            ldd  #0
2477 d3ce e7 f1               stb  [,s++]
2478 d3d0 cc 70 38            ldd  #buffer
2479 d3d3 34 06               pshs d
2480 d3d5 cc 00 05            ldd  #5
2481 d3d8 e3 e1               addd ,s++
2482 d3da 34 06               pshs d
2483 d3dc cc 00 00            ldd  #0
2484 d3df e7 f1               stb  [,s++]
2485 d3e1 cc 70 38            ldd  #buffer
2486 d3e4 34 06               pshs d
2487 d3e6 cc 00 01            ldd  #1
2488 d3e9 e3 e1               addd ,s++
2489 d3eb 34 06               pshs d
2490 d3ed cc 00 00            ldd  #0
2491 d3f0 e7 f1               stb  [,s++]
2492 d3f2 cc 70 38            ldd  #buffer
2493 d3f5 34 06               pshs d
2494 d3f7 cc 00 00            ldd  #0
2495 d3fa e3 e1               addd ,s++
2496 d3fc 34 06               pshs d
2497 d3fe cc 00 3f            ldd  #63
2498 d401 e7 f1               stb  [,s++]
2499 d403 39                  rts
2500
2501                         * .global accb
2502                         accb:
2503 d404 f6 70 33            ldb  USER_B
2504 d407 1d                  sex
2505 d408 f7 70 04            stb  n
2506 d40b cc 70 38            ldd  #buffer
2507 d40e 34 06               pshs d
2508 d410 cc 00 02            ldd  #2
2509 d413 e3 e1               addd ,s++
2510 d415 34 06               pshs d
2511 d417 cc c1 0d            ldd  #convert
2512 d41a 34 06               pshs d
2513 d41c f6 70 04            ldb  n
2514 d41f 1d                  sex
2515 d420 34 06               pshs d
2516 d422 cc 00 0f            ldd  #15
2517 d425 a4 e0               anda ,s+
2518 d427 e4 e0               andb ,s+
2519 d429 e3 e1               addd ,s++
2520 d42b 34 06               pshs d
2521 d42d e6 f1               ldb  [,s++]
2522 d42f 1d                  sex
2523 d430 e7 f1               stb  [,s++]
2524 d432 f6 70 04            ldb  n
2525 d435 1d                  sex
2526 d436 34 06               pshs d
2527 d438 cc 00 04            ldd  #4
2528 d43b 5a                  decb
2529 d43c 2d 06               blt  *+8
2530 d43e 64 e4               lsr  ,s
2531 d440 66 61               ror  1,s
2532 d442 20 f7               bra *-7
2533 d444 35 06               puls d
2534 d446 f7 70 04            stb  n
2535 d449 cc 70 38            ldd  #buffer
2536 d44c 34 06               pshs d
2537 d44e cc 00 03            ldd  #3
2538 d451 e3 e1               addd ,s++
2539 d453 34 06               pshs d
2540 d455 cc c1 0d            ldd  #convert
2541 d458 34 06               pshs d
2542 d45a f6 70 04            ldb  n
2543 d45d 1d                  sex
2544 d45e 34 06               pshs d
2545 d460 cc 00 0f            ldd  #15
2546 d463 a4 e0               anda ,s+
2547 d465 e4 e0               andb ,s+
2548 d467 e3 e1               addd ,s++
2549 d469 34 06               pshs d
2550 d46b e6 f1               ldb  [,s++]
2551 d46d 1d                  sex
2552 d46e e7 f1               stb  [,s++]
2553 d470 cc 70 38            ldd  #buffer
2554 d473 34 06               pshs d
2555 d475 cc 00 04            ldd  #4
2556 d478 e3 e1               addd ,s++
2557 d47a 34 06               pshs d
2558 d47c cc 00 00            ldd  #0
2559 d47f e7 f1               stb  [,s++]
2560 d481 cc 70 38            ldd  #buffer
2561 d484 34 06               pshs d
2562 d486 cc 00 05            ldd  #5
2563 d489 e3 e1               addd ,s++
2564 d48b 34 06               pshs d
2565 d48d cc 00 00            ldd  #0
2566 d490 e7 f1               stb  [,s++]
2567 d492 cc 70 38            ldd  #buffer
2568 d495 34 06               pshs d
2569 d497 cc 00 01            ldd  #1
2570 d49a e3 e1               addd ,s++
2571 d49c 34 06               pshs d
2572 d49e cc 00 00            ldd  #0
2573 d4a1 e7 f1               stb  [,s++]
2574 d4a3 cc 70 38            ldd  #buffer
```

```
2575 d4a6 34 06                pshs d
2576 d4a8 cc 00 00             ldd  #0
2577 d4ab e3 e1                addd ,s++
2578 d4ad 34 06                pshs d
2579 d4af cc 00 a7             ldd  #167
2580 d4b2 e7 f1                stb  [,s++]
2581 d4b4 39                   rts
2582
2583                          * .global ab
2584                          ab:
2585 d4b5 f6 70 33             ldb  USER_B
2586 d4b8 1d                   sex
2587 d4b9 f7 70 04             stb  n
2588 d4bc cc 70 38             ldd  #buffer
2589 d4bf 34 06                pshs d
2590 d4c1 cc 00 02             ldd  #2
2591 d4c4 e3 e1                addd ,s++
2592 d4c6 34 06                pshs d
2593 d4c8 cc c1 0d             ldd  #convert
2594 d4cb 34 06                pshs d
2595 d4cd f6 70 04             ldb  n
2596 d4d0 1d                   sex
2597 d4d1 34 06                pshs d
2598 d4d3 cc 00 0f             ldd  #15
2599 d4d6 a4 e0                anda ,s+
2600 d4d8 e4 e0                andb ,s+
2601 d4da e3 e1                addd ,s++
2602 d4dc 34 06                pshs d
2603 d4de e6 f1                ldb  [,s++]
2604 d4e0 1d                   sex
2605 d4e1 e7 f1                stb  [,s++]
2606 d4e3 f6 70 04             ldb  n
2607 d4e6 1d                   sex
2608 d4e7 34 06                pshs d
2609 d4e9 cc 00 04             ldd  #4
2610 d4ec 5a                   decb
2611 d4ed 2d 06                blt  *+8
2612 d4ef 64 e4                lsr  ,s
2613 d4f1 66 61                ror  1,s
2614 d4f3 20 f7                bra *-7
2615 d4f5 35 06                puls d
2616 d4f7 f7 70 04             stb  n
2617 d4fa cc 70 38             ldd  #buffer
2618 d4fd 34 06                pshs d
2619 d4ff cc 00 03             ldd  #3
2620 d502 e3 e1                addd ,s++
2621 d504 34 06                pshs d
2622 d506 cc c1 0d             ldd  #convert
2623 d509 34 06                pshs d
2624 d50b f6 70 04             ldb  n
2625 d50e 1d                   sex
2626 d50f 34 06                pshs d
2627 d511 cc 00 0f             ldd  #15
2628 d514 a4 e0                anda ,s+
2629 d516 e4 e0                andb ,s+
2630 d518 e3 e1                addd ,s++
2631 d51a 34 06               pshs d
2632 d51c e6 f1               ldb  [,s++]
2633 d51e 1d                  sex
2634 d51f e7 f1               stb  [,s++]
2635 d521 f6 70 32            ldb  USER_A
2636 d524 1d                  sex
2637 d525 f7 70 04            stb  n
2638 d528 cc 70 38            ldd  #buffer
2639 d52b 34 06               pshs d
2640 d52d cc 00 04            ldd  #4
2641 d530 e3 e1               addd ,s++
2642 d532 34 06               pshs d
2643 d534 cc c1 0d            ldd  #convert
2644 d537 34 06               pshs d
2645 d539 f6 70 04            ldb  n
2646 d53c 1d                  sex
2647 d53d 34 06               pshs d
2648 d53f cc 00 0f            ldd  #15
2649 d542 a4 e0               anda ,s+
2650 d544 e4 e0               andb ,s+
2651 d546 e3 e1               addd ,s++
2652 d548 34 06               pshs d
2653 d54a e6 f1               ldb  [,s++]
2654 d54c 1d                  sex
2655 d54d e7 f1               stb  [,s++]
2656 d54f f6 70 04            ldb  n
2657 d552 1d                  sex
2658 d553 34 06               pshs d
2659 d555 cc 00 04            ldd  #4
2660 d558 5a                  decb
2661 d559 2d 06               blt  *+8
2662 d55b 64 e4               lsr  ,s
2663 d55d 66 61               ror  1,s
2664 d55f 20 f7               bra *-7
2665 d561 35 06               puls d
2666 d563 f7 70 04            stb  n
2667 d566 cc 70 38            ldd  #buffer
2668 d569 34 06               pshs d
2669 d56b cc 00 05            ldd  #5
2670 d56e e3 e1               addd ,s++
2671 d570 34 06               pshs d
2672 d572 cc c1 0d            ldd  #convert
2673 d575 34 06               pshs d
2674 d577 f6 70 04            ldb  n
2675 d57a 1d                  sex
2676 d57b 34 06               pshs d
2677 d57d cc 00 0f            ldd  #15
2678 d580 a4 e0               anda ,s+
2679 d582 e4 e0               andb ,s+
2680 d584 e3 e1               addd ,s++
2681 d586 34 06               pshs d
2682 d588 e6 f1               ldb  [,s++]
2683 d58a 1d                  sex
2684 d58b e7 f1               stb  [,s++]
2685 d58d cc 70 38            ldd  #buffer
2686 d590 34 06               pshs d
```

```
2687 d592 cc 00 01             ldd  #1
2688 d595 e3 e1                addd ,s++
2689 d597 34 06                pshs d
2690 d599 cc 00 3f             ldd  #63
2691 d59c e7 f1                stb  [,s++]
2692 d59e cc 70 38             ldd  #buffer
2693 d5a1 34 06                pshs d
2694 d5a3 cc 00 00             ldd  #0
2695 d5a6 e3 e1                addd ,s++
2696 d5a8 34 06                pshs d
2697 d5aa cc 00 a7             ldd  #167
2698 d5ad e7 f1                stb  [,s++]
2699 d5af 39                   rts
2700
2701                          * .global reg_x
2702                          reg_x:
2703 d5b0 fc 70 2c             ldd  USER_X
2704 d5b3 fd 70 17             std  temp16
2705 d5b6 fc 70 17             ldd  temp16
2706 d5b9 34 06                pshs d
2707 d5bb bd cc 8a             jsr hex4
2708 d5be 32 62                leas 2,s
2709 d5c0 cc 70 38             ldd  #buffer
2710 d5c3 34 06                pshs d
2711 d5c5 cc 00 01             ldd  #1
2712 d5c8 e3 e1                addd ,s++
2713 d5ca 34 06                pshs d
2714 d5cc cc 00 00             ldd  #0
2715 d5cf e7 f1                stb  [,s++]
2716 d5d1 cc 70 38             ldd  #buffer
2717 d5d4 34 06                pshs d
2718 d5d6 cc 00 00             ldd  #0
2719 d5d9 e3 e1                addd ,s++
2720 d5db 34 06                pshs d
2721 d5dd cc 00 13             ldd  #19
2722 d5e0 e7 f1                stb  [,s++]
2723 d5e2 39                   rts
2724
2725                          * .global reg_y
2726                          reg_y:
2727 d5e3 fc 70 30             ldd  USER_Y
2728 d5e6 fd 70 17             std  temp16
2729 d5e9 fc 70 17             ldd  temp16
2730 d5ec 34 06                pshs d
2731 d5ee bd cc 8a             jsr hex4
2732 d5f1 32 62                leas 2,s
2733 d5f3 cc 70 38             ldd  #buffer
2734 d5f6 34 06                pshs d
2735 d5f8 cc 00 01             ldd  #1
2736 d5fb e3 e1                addd ,s++
2737 d5fd 34 06                pshs d
2738 d5ff cc 00 00             ldd  #0
2739 d602 e7 f1                stb  [,s++]
2740 d604 cc 70 38             ldd  #buffer
2741 d607 34 06                pshs d
2742 d609 cc 00 00             ldd  #0
```

```
2743 d60c e3 e1               addd ,s++
2744 d60e 34 06               pshs d
2745 d610 cc 00 b6            ldd  #182
2746 d613 e7 f1               stb  [,s++]
2747 d615 39                  rts
2748
2749                         * .global reg_u
2750                         reg_u:
2751 d616 fc 70 2a            ldd  USER_U
2752 d619 fd 70 17            std  temp16
2753 d61c fc 70 17            ldd  temp16
2754 d61f 34 06               pshs d
2755 d621 bd cc 8a            jsr hex4
2756 d624 32 62               leas 2,s
2757 d626 cc 70 38            ldd  #buffer
2758 d629 34 06               pshs d
2759 d62b cc 00 01            ldd  #1
2760 d62e e3 e1               addd ,s++
2761 d630 34 06               pshs d
2762 d632 cc 00 00            ldd  #0
2763 d635 e7 f1               stb  [,s++]
2764 d637 cc 70 38            ldd  #buffer
2765 d63a 34 06               pshs d
2766 d63c cc 00 00            ldd  #0
2767 d63f e3 e1               addd ,s++
2768 d641 34 06               pshs d
2769 d643 cc 00 b5            ldd  #181
2770 d646 e7 f1               stb  [,s++]
2771 d648 39                  rts
2772
2773                         * .global reg_s
2774                         reg_s:
2775 d649 fc 70 2e            ldd  SAVE_SP
2776 d64c fd 70 17            std  temp16
2777 d64f fc 70 17            ldd  temp16
2778 d652 34 06               pshs d
2779 d654 bd cc 8a            jsr hex4
2780 d657 32 62               leas 2,s
2781 d659 cc 70 38            ldd  #buffer
2782 d65c 34 06               pshs d
2783 d65e cc 00 01            ldd  #1
2784 d661 e3 e1               addd ,s++
2785 d663 34 06               pshs d
2786 d665 cc 00 00            ldd  #0
2787 d668 e7 f1               stb  [,s++]
2788 d66a cc 70 38            ldd  #buffer
2789 d66d 34 06               pshs d
2790 d66f cc 00 00            ldd  #0
2791 d672 e3 e1               addd ,s++
2792 d674 34 06               pshs d
2793 d676 cc 00 ae            ldd  #174
2794 d679 e7 f1               stb  [,s++]
2795 d67b 39                  rts
2796
2797                         * .global reg_dp
2798                         reg_dp:
```

```
2799 d67c f6 70 35          ldb  USER_DP
2800 d67f 1d                sex
2801 d680 f7 70 04          stb  n
2802 d683 cc 70 38          ldd  #buffer
2803 d686 34 06             pshs d
2804 d688 cc 00 02          ldd  #2
2805 d68b e3 e1             addd ,s++
2806 d68d 34 06             pshs d
2807 d68f cc c1 0d          ldd  #convert
2808 d692 34 06             pshs d
2809 d694 f6 70 04          ldb  n
2810 d697 1d                sex
2811 d698 34 06             pshs d
2812 d69a cc 00 0f          ldd  #15
2813 d69d a4 e0             anda ,s+
2814 d69f e4 e0             andb ,s+
2815 d6a1 e3 e1             addd ,s++
2816 d6a3 34 06             pshs d
2817 d6a5 e6 f1             ldb  [,s++]
2818 d6a7 1d                sex
2819 d6a8 e7 f1             stb  [,s++]
2820 d6aa f6 70 04          ldb  n
2821 d6ad 1d                sex
2822 d6ae 34 06             pshs d
2823 d6b0 cc 00 04          ldd  #4
2824 d6b3 5a                decb
2825 d6b4 2d 06             blt  *+8
2826 d6b6 64 e4             lsr  ,s
2827 d6b8 66 61             ror  1,s
2828 d6ba 20 f7             bra *-7
2829 d6bc 35 06             puls d
2830 d6be f7 70 04          stb  n
2831 d6c1 cc 70 38          ldd  #buffer
2832 d6c4 34 06             pshs d
2833 d6c6 cc 00 03          ldd  #3
2834 d6c9 e3 e1             addd ,s++
2835 d6cb 34 06             pshs d
2836 d6cd cc c1 0d          ldd  #convert
2837 d6d0 34 06             pshs d
2838 d6d2 f6 70 04          ldb  n
2839 d6d5 1d                sex
2840 d6d6 34 06             pshs d
2841 d6d8 cc 00 0f          ldd  #15
2842 d6db a4 e0             anda ,s+
2843 d6dd e4 e0             andb ,s+
2844 d6df e3 e1             addd ,s++
2845 d6e1 34 06             pshs d
2846 d6e3 e6 f1             ldb  [,s++]
2847 d6e5 1d                sex
2848 d6e6 e7 f1             stb  [,s++]
2849 d6e8 cc 70 38          ldd  #buffer
2850 d6eb 34 06             pshs d
2851 d6ed cc 00 04          ldd  #4
2852 d6f0 e3 e1             addd ,s++
2853 d6f2 34 06             pshs d
2854 d6f4 cc 00 00          ldd  #0
```

```
2855 d6f7 e7 f1               stb  [,s++]
2856 d6f9 cc 70 38            ldd  #buffer
2857 d6fc 34 06               pshs d
2858 d6fe cc 00 05            ldd  #5
2859 d701 e3 e1               addd ,s++
2860 d703 34 06               pshs d
2861 d705 cc 00 00            ldd  #0
2862 d708 e7 f1               stb  [,s++]
2863 d70a cc 70 38            ldd  #buffer
2864 d70d 34 06               pshs d
2865 d70f cc 00 01            ldd  #1
2866 d712 e3 e1               addd ,s++
2867 d714 34 06               pshs d
2868 d716 cc 00 b3            ldd  #179
2869 d719 e7 f1               stb  [,s++]
2870 d71b cc 70 38            ldd  #buffer
2871 d71e 34 06               pshs d
2872 d720 cc 00 00            ldd  #0
2873 d723 e3 e1               addd ,s++
2874 d725 34 06               pshs d
2875 d727 cc 00 1f            ldd  #31
2876 d72a e7 f1               stb  [,s++]
2877 d72c 39                  rts
2878
2879                         * .global low_cc
2880                         low_cc:
2881 d72d f6 70 34            ldb  USER_P
2882 d730 1d                  sex
2883 d731 f7 70 04            stb  n
2884 d734 f6 70 04            ldb  n
2885 d737 1d                  sex
2886 d738 34 06               pshs d
2887 d73a cc 00 01            ldd  #1
2888 d73d a4 e0               anda ,s+
2889 d73f e4 e0               andb ,s+
2890 d741 10 83 00 00         cmpd #0
2891 d745 10 27 00 14         lbeq cc89
2892 d749 cc 70 38            ldd  #buffer
2893 d74c 34 06               pshs d
2894 d74e cc 00 02            ldd  #2
2895 d751 e3 e1               addd ,s++
2896 d753 34 06               pshs d
2897 d755 cc 00 30            ldd  #48
2898 d758 e7 f1               stb  [,s++]
2899 d75a 7e d7 6e            jmp cc90
2900                         cc89:
2901 d75d cc 70 38            ldd  #buffer
2902 d760 34 06               pshs d
2903 d762 cc 00 02            ldd  #2
2904 d765 e3 e1               addd ,s++
2905 d767 34 06               pshs d
2906 d769 cc 00 bd            ldd  #189
2907 d76c e7 f1               stb  [,s++]
2908                         cc90:
2909 d76e f6 70 04            ldb  n
2910 d771 1d                  sex
```

```
2911 d772 34 06                   pshs d
2912 d774 cc 00 02                ldd  #2
2913 d777 a4 e0                   anda ,s+
2914 d779 e4 e0                   andb ,s+
2915 d77b 10 83 00 00             cmpd #0
2916 d77f 10 27 00 14             lbeq cc91
2917 d783 cc 70 38                ldd  #buffer
2918 d786 34 06                   pshs d
2919 d788 cc 00 03                ldd  #3
2920 d78b e3 e1                   addd ,s++
2921 d78d 34 06                   pshs d
2922 d78f cc 00 30                ldd  #48
2923 d792 e7 f1                   stb  [,s++]
2924 d794 7e d7 a8                jmp cc92
2925                             cc91:
2926 d797 cc 70 38                ldd  #buffer
2927 d79a 34 06                   pshs d
2928 d79c cc 00 03                ldd  #3
2929 d79f e3 e1                   addd ,s++
2930 d7a1 34 06                   pshs d
2931 d7a3 cc 00 bd                ldd  #189
2932 d7a6 e7 f1                   stb  [,s++]
2933                             cc92:
2934 d7a8 f6 70 04                ldb  n
2935 d7ab 1d                      sex
2936 d7ac 34 06                   pshs d
2937 d7ae cc 00 04                ldd  #4
2938 d7b1 a4 e0                   anda ,s+
2939 d7b3 e4 e0                   andb ,s+
2940 d7b5 10 83 00 00             cmpd #0
2941 d7b9 10 27 00 14             lbeq cc93
2942 d7bd cc 70 38                ldd  #buffer
2943 d7c0 34 06                   pshs d
2944 d7c2 cc 00 04                ldd  #4
2945 d7c5 e3 e1                   addd ,s++
2946 d7c7 34 06                   pshs d
2947 d7c9 cc 00 30                ldd  #48
2948 d7cc e7 f1                   stb  [,s++]
2949 d7ce 7e d7 e2                jmp cc94
2950                             cc93:
2951 d7d1 cc 70 38                ldd  #buffer
2952 d7d4 34 06                   pshs d
2953 d7d6 cc 00 04                ldd  #4
2954 d7d9 e3 e1                   addd ,s++
2955 d7db 34 06                   pshs d
2956 d7dd cc 00 bd                ldd  #189
2957 d7e0 e7 f1                   stb  [,s++]
2958                             cc94:
2959 d7e2 f6 70 04                ldb  n
2960 d7e5 1d                      sex
2961 d7e6 34 06                   pshs d
2962 d7e8 cc 00 08                ldd  #8
2963 d7eb a4 e0                   anda ,s+
2964 d7ed e4 e0                   andb ,s+
2965 d7ef 10 83 00 00             cmpd #0
2966 d7f3 10 27 00 14             lbeq cc95
```

```
2967 d7f7 cc 70 38            ldd  #buffer
2968 d7fa 34 06               pshs d
2969 d7fc cc 00 05            ldd  #5
2970 d7ff e3 e1               addd ,s++
2971 d801 34 06               pshs d
2972 d803 cc 00 30            ldd  #48
2973 d806 e7 f1               stb  [,s++]
2974 d808 7e d8 1c            jmp cc96
2975                         cc95:
2976 d80b cc 70 38            ldd  #buffer
2977 d80e 34 06               pshs d
2978 d810 cc 00 05            ldd  #5
2979 d813 e3 e1               addd ,s++
2980 d815 34 06               pshs d
2981 d817 cc 00 bd            ldd  #189
2982 d81a e7 f1               stb  [,s++]
2983                         cc96:
2984 d81c cc 70 38            ldd  #buffer
2985 d81f 34 06               pshs d
2986 d821 cc 00 01            ldd  #1
2987 d824 e3 e1               addd ,s++
2988 d826 34 06               pshs d
2989 d828 cc 00 8d            ldd  #141
2990 d82b e7 f1               stb  [,s++]
2991 d82d cc 70 38            ldd  #buffer
2992 d830 34 06               pshs d
2993 d832 cc 00 00            ldd  #0
2994 d835 e3 e1               addd ,s++
2995 d837 34 06               pshs d
2996 d839 cc 00 85            ldd  #133
2997 d83c e7 f1               stb  [,s++]
2998 d83e 39                  rts
2999
3000                         * .global hi_cc
3001                         hi_cc:
3002 d83f f6 70 34            ldb  USER_P
3003 d842 1d                  sex
3004 d843 f7 70 04            stb  n
3005 d846 f6 70 04            ldb  n
3006 d849 1d                  sex
3007 d84a 34 06               pshs d
3008 d84c cc 00 10            ldd  #16
3009 d84f a4 e0               anda ,s+
3010 d851 e4 e0               andb ,s+
3011 d853 10 83 00 00         cmpd #0
3012 d857 10 27 00 14         lbeq cc97
3013 d85b cc 70 38            ldd  #buffer
3014 d85e 34 06               pshs d
3015 d860 cc 00 02            ldd  #2
3016 d863 e3 e1               addd ,s++
3017 d865 34 06               pshs d
3018 d867 cc 00 30            ldd  #48
3019 d86a e7 f1               stb  [,s++]
3020 d86c 7e d8 80            jmp cc98
3021                         cc97:
3022 d86f cc 70 38            ldd  #buffer
```

```
3023 d872 34 06               pshs d
3024 d874 cc 00 02            ldd  #2
3025 d877 e3 e1               addd ,s++
3026 d879 34 06               pshs d
3027 d87b cc 00 bd            ldd  #189
3028 d87e e7 f1               stb  [,s++]
3029                         cc98:
3030 d880 f6 70 04            ldb  n
3031 d883 1d                  sex
3032 d884 34 06               pshs d
3033 d886 cc 00 20            ldd  #32
3034 d889 a4 e0               anda ,s+
3035 d88b e4 e0               andb ,s+
3036 d88d 10 83 00 00         cmpd #0
3037 d891 10 27 00 14         lbeq cc99
3038 d895 cc 70 38            ldd  #buffer
3039 d898 34 06               pshs d
3040 d89a cc 00 03            ldd  #3
3041 d89d e3 e1               addd ,s++
3042 d89f 34 06               pshs d
3043 d8a1 cc 00 30            ldd  #48
3044 d8a4 e7 f1               stb  [,s++]
3045 d8a6 7e d8 ba            jmp cc100
3046                         cc99:
3047 d8a9 cc 70 38            ldd  #buffer
3048 d8ac 34 06               pshs d
3049 d8ae cc 00 03            ldd  #3
3050 d8b1 e3 e1               addd ,s++
3051 d8b3 34 06               pshs d
3052 d8b5 cc 00 bd            ldd  #189
3053 d8b8 e7 f1               stb  [,s++]
3054                         cc100:
3055 d8ba f6 70 04            ldb  n
3056 d8bd 1d                  sex
3057 d8be 34 06               pshs d
3058 d8c0 cc 00 40            ldd  #64
3059 d8c3 a4 e0               anda ,s+
3060 d8c5 e4 e0               andb ,s+
3061 d8c7 10 83 00 00         cmpd #0
3062 d8cb 10 27 00 14         lbeq cc101
3063 d8cf cc 70 38            ldd  #buffer
3064 d8d2 34 06               pshs d
3065 d8d4 cc 00 04            ldd  #4
3066 d8d7 e3 e1               addd ,s++
3067 d8d9 34 06               pshs d
3068 d8db cc 00 30            ldd  #48
3069 d8de e7 f1               stb  [,s++]
3070 d8e0 7e d8 f4            jmp cc102
3071                         cc101:
3072 d8e3 cc 70 38            ldd  #buffer
3073 d8e6 34 06               pshs d
3074 d8e8 cc 00 04            ldd  #4
3075 d8eb e3 e1               addd ,s++
3076 d8ed 34 06               pshs d
3077 d8ef cc 00 bd            ldd  #189
3078 d8f2 e7 f1               stb  [,s++]
```

```
3079                         cc102:
3080 d8f4 f6 70 04            ldb  n
3081 d8f7 1d                  sex
3082 d8f8 34 06               pshs d
3083 d8fa cc 00 80            ldd  #128
3084 d8fd a4 e0               anda ,s+
3085 d8ff e4 e0               andb ,s+
3086 d901 10 83 00 00         cmpd #0
3087 d905 10 27 00 14         lbeq cc103
3088 d909 cc 70 38            ldd  #buffer
3089 d90c 34 06               pshs d
3090 d90e cc 00 05            ldd  #5
3091 d911 e3 e1               addd ,s++
3092 d913 34 06               pshs d
3093 d915 cc 00 30            ldd  #48
3094 d918 e7 f1               stb  [,s++]
3095 d91a 7e d9 2e            jmp cc104
3096                         cc103:
3097 d91d cc 70 38            ldd  #buffer
3098 d920 34 06               pshs d
3099 d922 cc 00 05            ldd  #5
3100 d925 e3 e1               addd ,s++
3101 d927 34 06               pshs d
3102 d929 cc 00 bd            ldd  #189
3103 d92c e7 f1               stb  [,s++]
3104                         cc104:
3105 d92e cc 70 38            ldd  #buffer
3106 d931 34 06               pshs d
3107 d933 cc 00 01            ldd  #1
3108 d936 e3 e1               addd ,s++
3109 d938 34 06               pshs d
3110 d93a cc 00 8d            ldd  #141
3111 d93d e7 f1               stb  [,s++]
3112 d93f cc 70 38            ldd  #buffer
3113 d942 34 06               pshs d
3114 d944 cc 00 00            ldd  #0
3115 d947 e3 e1               addd ,s++
3116 d949 34 06               pshs d
3117 d94b cc 00 37            ldd  #55
3118 d94e e7 f1               stb  [,s++]
3119 d950 39                  rts
3120
3121                         * .global reg_disp
3122                         reg_disp:
3123 d951 f6 70 09            ldb  key
3124 d954 1d                  sex
3125 d955 7e d9 97            jmp cc107
3126                         cc108:
3127 d958 bd d3 53            jsr acca
3128 d95b 7e d9 c4            jmp cc106
3129                         cc109:
3130 d95e bd d4 04            jsr accb
3131 d961 7e d9 c4            jmp cc106
3132                         cc110:
3133 d964 bd d4 b5            jsr ab
3134 d967 7e d9 c4            jmp cc106
```

```
3135                         cc111:
3136 d96a bd d5 b0            jsr reg_x
3137 d96d 7e d9 c4            jmp cc106
3138                         cc112:
3139 d970 bd d5 e3            jsr reg_y
3140 d973 7e d9 c4            jmp cc106
3141                         cc113:
3142 d976 bd d6 16            jsr reg_u
3143 d979 7e d9 c4            jmp cc106
3144                         cc114:
3145 d97c bd d6 49            jsr reg_s
3146 d97f 7e d9 c4            jmp cc106
3147                         cc115:
3148 d982 bd d6 7c            jsr reg_dp
3149 d985 7e d9 c4            jmp cc106
3150                         cc116:
3151 d988 bd d7 2d            jsr low_cc
3152 d98b 7e d9 c4            jmp cc106
3153                         cc117:
3154 d98e bd d8 3f            jsr hi_cc
3155 d991 7e d9 c4            jmp cc106
3156 d994 7e d9 c4            jmp cc106
3157                         cc107:
3158 d997 bd c0 f9            jsr ccswitch
3159 d99a d9 58 00 00         FDB cc108,0
3160 d99e d9 5e 00 01         FDB cc109,1
3161 d9a2 d9 64 00 02         FDB cc110,2
3162 d9a6 d9 6a 00 06         FDB cc111,6
3163 d9aa d9 70 00 07         FDB cc112,7
3164 d9ae d9 76 00 09         FDB cc113,9
3165 d9b2 d9 7c 00 0a         FDB cc114,10
3166 d9b6 d9 82 00 08         FDB cc115,8
3167 d9ba d9 88 00 05         FDB cc116,5
3168 d9be d9 8e 00 04         FDB cc117,4
3169 d9c2 00 00               FDB 0
3170                         cc106:
3171 d9c4 39                  rts
3172
3173                         * .global insert
3174                         insert:
3175 d9c5 f6 70 27            ldb  state
3176 d9c8 1d                  sex
3177 d9c9 34 06               pshs d
3178 d9cb cc 00 01            ldd  #1
3179 d9ce 10 a3 e1            cmpd ,s++
3180 d9d1 27 05               beq  *+7
3181 d9d3 cc 00 00            ldd  #0
3182 d9d6 20 03               bra  *+5
3183 d9d8 cc 00 01            ldd  #1
3184 d9db 10 83 00 00         cmpd #0
3185 d9df 10 26 00 24         lbne cc119
3186 d9e3 f6 70 27            ldb  state
3187 d9e6 1d                  sex
3188 d9e7 34 06               pshs d
3189 d9e9 cc 00 02            ldd  #2
3190 d9ec 10 a3 e1            cmpd ,s++
3191 d9ef 27 05               beq  *+7
3192 d9f1 cc 00 00            ldd  #0
3193 d9f4 20 03               bra  *+5
3194 d9f6 cc 00 01            ldd  #1
3195 d9f9 10 83 00 00         cmpd #0
3196 d9fd 10 26 00 06         lbne cc119
3197 da01 cc 00 00            ldd  #0
3198 da04 7e da 0a            jmp cc120
3199                         cc119:
3200 da07 cc 00 01            ldd  #1
3201                         cc120:
3202 da0a 10 83 00 00         cmpd #0
3203 da0e 10 27 00 8e         lbeq cc118
3204 da12 fc 70 19            ldd  PC
3205 da15 fd 70 46            std  dptr
3206 da18 cc 02 00            ldd  #512
3207 da1b fd 70 02            std  j
3208                         cc123:
3209 da1e fc 70 02            ldd  j
3210 da21 34 06               pshs d
3211 da23 cc 00 00            ldd  #0
3212 da26 10 a3 e1            cmpd ,s++
3213 da29 2d 05               blt  *+7
3214 da2b cc 00 00            ldd  #0
3215 da2e 20 03               bra  *+5
3216 da30 cc 00 01            ldd  #1
3217 da33 10 83 00 00         cmpd #0
3218 da37 10 27 00 3f         lbeq cc122
3219 da3b 7e da 4d            jmp cc124
3220                         cc121:
3221 da3e fc 70 02            ldd  j
3222 da41 83 00 01            subd #1
3223 da44 fd 70 02            std  j
3224 da47 c3 00 01            addd #1
3225 da4a 7e da 1e            jmp cc123
3226                         cc124:
3227 da4d fc 70 46            ldd  dptr
3228 da50 34 06               pshs d
3229 da52 fc 70 02            ldd  j
3230 da55 e3 e1               addd ,s++
3231 da57 34 06               pshs d
3232 da59 fc 70 46            ldd  dptr
3233 da5c 34 06               pshs d
3234 da5e fc 70 02            ldd  j
3235 da61 e3 e1               addd ,s++
3236 da63 34 06               pshs d
3237 da65 cc 00 01            ldd  #1
3238 da68 35 10               puls x
3239 da6a 34 06               pshs d
3240 da6c 1f 10               tfr  x,d
3241 da6e a3 e1               subd ,s++
3242 da70 34 06               pshs d
3243 da72 e6 f1               ldb  [,s++]
3244 da74 1d                  sex
3245 da75 e7 f1               stb  [,s++]
3246 da77 7e da 3e            jmp cc121
```

```
3247                         cc122:
3248 da7a fc 70 46            ldd  dptr
3249 da7d 34 06               pshs d
3250 da7f cc 00 01            ldd  #1
3251 da82 e3 e1               addd ,s++
3252 da84 34 06               pshs d
3253 da86 cc 00 00            ldd  #0
3254 da89 e7 f1               stb  [,s++]
3255 da8b fc 70 19            ldd  PC
3256 da8e c3 00 01            addd #1
3257 da91 fd 70 19            std  PC
3258 da94 83 00 01            subd #1
3259 da97 bd ce 09            jsr read_mem
3260 da9a cc 00 02            ldd  #2
3261 da9d f7 70 27            stb  state
3262                         cc118:
3263 daa0 39                  rts
3264
3265                         * .global cut_byte
3266                         cut_byte:
3267 daa1 f6 70 27            ldb  state
3268 daa4 1d                  sex
3269 daa5 34 06               pshs d
3270 daa7 cc 00 01            ldd  #1
3271 daaa 10 a3 e1            cmpd ,s++
3272 daad 27 05               beq  *+7
3273 daaf cc 00 00            ldd  #0
3274 dab2 20 03               bra  *+5
3275 dab4 cc 00 01            ldd  #1
3276 dab7 10 83 00 00         cmpd #0
3277 dabb 10 26 00 24         lbne cc126
3278 dabf f6 70 27            ldb  state
3279 dac2 1d                  sex
3280 dac3 34 06               pshs d
3281 dac5 cc 00 02            ldd  #2
3282 dac8 10 a3 e1            cmpd ,s++
3283 dacb 27 05               beq  *+7
3284 dacd cc 00 00            ldd  #0
3285 dad0 20 03               bra  *+5
3286 dad2 cc 00 01            ldd  #1
3287 dad5 10 83 00 00         cmpd #0
3288 dad9 10 26 00 06         lbne cc126
3289 dadd cc 00 00            ldd  #0
3290 dae0 7e da e6            jmp cc127
3291                         cc126:
3292 dae3 cc 00 01            ldd  #1
3293                         cc127:
3294 dae6 10 83 00 00         cmpd #0
3295 daea 10 27 00 6b         lbeq cc125
3296 daee fc 70 19            ldd  PC
3297 daf1 fd 70 46            std  dptr
3298 daf4 cc 00 00            ldd  #0
3299 daf7 fd 70 02            std  j
3300                         cc130:
3301 dafa fc 70 02            ldd  j
3302 dafd 34 06               pshs d
```

```
3303 daff cc 02 00            ldd  #512
3304 db02 10 a3 e1            cmpd ,s++
3305 db05 2e 05               bgt  *+7
3306 db07 cc 00 00            ldd  #0
3307 db0a 20 03               bra  *+5
3308 db0c cc 00 01            ldd  #1
3309 db0f 10 83 00 00         cmpd #0
3310 db13 10 27 00 39         lbeq cc129
3311 db17 7e db 29            jmp cc131
3312                         cc128:
3313 db1a fc 70 02            ldd  j
3314 db1d c3 00 01            addd #1
3315 db20 fd 70 02            std  j
3316 db23 83 00 01            subd #1
3317 db26 7e da fa            jmp cc130
3318                         cc131:
3319 db29 fc 70 46            ldd  dptr
3320 db2c 34 06               pshs d
3321 db2e fc 70 02            ldd  j
3322 db31 e3 e1               addd ,s++
3323 db33 34 06               pshs d
3324 db35 fc 70 46            ldd  dptr
3325 db38 34 06               pshs d
3326 db3a fc 70 02            ldd  j
3327 db3d e3 e1               addd ,s++
3328 db3f 34 06               pshs d
3329 db41 cc 00 01            ldd  #1
3330 db44 e3 e1               addd ,s++
3331 db46 34 06               pshs d
3332 db48 e6 f1               ldb  [,s++]
3333 db4a 1d                  sex
3334 db4b e7 f1               stb  [,s++]
3335 db4d 7e db 1a            jmp cc128
3336                         cc129:
3337 db50 bd ce 09            jsr read_mem
3338 db53 cc 00 02            ldd  #2
3339 db56 f7 70 27            stb  state
3340                         cc125:
3341 db59 39                  rts
3342
3343                         * .global key_test
3344                         key_test:
3345 db5a 1c ef                   andcc #$ef
3346 db5c cc 00 00            ldd  #0
3347 db5f fd 70 25            std  t
3348 db62 cc 70 38            ldd  #buffer
3349 db65 34 06               pshs d
3350 db67 cc 00 00            ldd  #0
3351 db6a e3 e1               addd ,s++
3352 db6c 34 06               pshs d
3353 db6e cc 00 00            ldd  #0
3354 db71 e7 f1               stb  [,s++]
3355 db73 cc 70 38            ldd  #buffer
3356 db76 34 06               pshs d
3357 db78 cc 00 01            ldd  #1
3358 db7b e3 e1               addd ,s++
3359 db7d 34 06               pshs d
3360 db7f cc 00 00            ldd  #0
3361 db82 e7 f1               stb  [,s++]
3362                         cc132:
3363 db84 cc 00 01            ldd  #1
3364 db87 10 83 00 00         cmpd #0
3365 db8b 10 27 00 4d         lbeq cc133
3366                         cc134:
3367 db8f f6 70 0e            ldb  tick
3368 db92 1d                  sex
3369 db93 34 06               pshs d
3370 db95 cc 00 0a            ldd  #10
3371 db98 10 a3 e1            cmpd ,s++
3372 db9b 2e 05               bgt  *+7
3373 db9d cc 00 00            ldd  #0
3374 dba0 20 03               bra  *+5
3375 dba2 cc 00 01            ldd  #1
3376 dba5 10 83 00 00         cmpd #0
3377 dba9 10 27 00 06         lbeq cc135
3378 dbad bd c8 84            jsr scan
3379 dbb0 7e db 8f            jmp cc134
3380                         cc135:
3381 dbb3 cc 00 00            ldd  #0
3382 dbb6 f7 70 0e            stb  tick
3383 dbb9 fc 70 25            ldd  t
3384 dbbc 34 06               pshs d
3385 dbbe bd cc 8a            jsr hex4
3386 dbc1 32 62               leas 2,s
3387 dbc3 fc 70 3e            ldd  gpio1
3388 dbc6 34 06               pshs d
3389 dbc8 fc 70 25            ldd  t
3390 dbcb e7 f1               stb  [,s++]
3391 dbcd fc 70 25            ldd  t
3392 dbd0 c3 00 01            addd #1
3393 dbd3 fd 70 25            std  t
3394 dbd6 83 00 01            subd #1
3395 dbd9 7e db 84            jmp cc132
3396                         cc133:
3397 dbdc 39                  rts
3398
3399                         * .global clear_bu
3400                         clear_bu:
3401 dbdd cc 00 00            ldd  #0
3402 dbe0 fd 70 00            std  i
3403                         cc138:
3404 dbe3 fc 70 00            ldd  i
3405 dbe6 34 06               pshs d
3406 dbe8 cc 00 06            ldd  #6
3407 dbeb 10 a3 e1            cmpd ,s++
3408 dbee 2e 05               bgt  *+7
3409 dbf0 cc 00 00            ldd  #0
3410 dbf3 20 03               bra  *+5
3411 dbf5 cc 00 01            ldd  #1
3412 dbf8 10 83 00 00         cmpd #0
3413 dbfc 10 27 00 26         lbeq cc137
3414 dc00 7e dc 12            jmp cc139
```

```
3415                         cc136:
3416 dc03 fc 70 00            ldd  i
3417 dc06 c3 00 01            addd #1
3418 dc09 fd 70 00            std  i
3419 dc0c 83 00 01            subd #1
3420 dc0f 7e db e3            jmp cc138
3421                         cc139:
3422 dc12 cc 70 38            ldd  #buffer
3423 dc15 34 06               pshs d
3424 dc17 fc 70 00            ldd  i
3425 dc1a e3 e1               addd ,s++
3426 dc1c 34 06               pshs d
3427 dc1e cc 00 00            ldd  #0
3428 dc21 e7 f1               stb  [,s++]
3429 dc23 7e dc 03            jmp cc136
3430                         cc137:
3431 dc26 39                  rts
3432
3433                         * .global key_cal
3434                         key_cal:
3435 dc27 cc 00 04            ldd  #4
3436 dc2a f7 70 27            stb  state
3437 dc2d bd db dd            jsr clear_bu
3438 dc30 cc 70 38            ldd  #buffer
3439 dc33 34 06               pshs d
3440 dc35 cc 00 02            ldd  #2
3441 dc38 e3 e1               addd ,s++
3442 dc3a 34 06               pshs d
3443 dc3c cc 00 bd            ldd  #189
3444 dc3f e7 f1               stb  [,s++]
3445 dc41 cc 00 00            ldd  #0
3446 dc44 fd 70 1f            std  start
3447 dc47 cc 00 00            ldd  #0
3448 dc4a fd 70 23            std  desti
3449 dc4d cc 00 00            ldd  #0
3450 dc50 f7 70 0b            stb  hit
3451 dc53 39                  rts
3452
3453                         * .global enter_nu
3454                         enter_nu:
3455 dc54 f6 70 0b            ldb  hit
3456 dc57 1d                  sex
3457 dc58 34 06               pshs d
3458 dc5a cc 00 00            ldd  #0
3459 dc5d 10 a3 e1            cmpd ,s++
3460 dc60 27 05               beq  *+7
3461 dc62 cc 00 00            ldd  #0
3462 dc65 20 03               bra  *+5
3463 dc67 cc 00 01            ldd  #1
3464 dc6a 10 83 00 00         cmpd #0
3465 dc6e 10 27 00 06         lbeq cc140
3466 dc72 cc 00 00            ldd  #0
3467 dc75 fd 70 1d            std  num
3468                         cc140:
3469 dc78 cc 00 01            ldd  #1
3470 dc7b f7 70 0b            stb  hit
```

```
3471 dc7e cc 70 1d            ldd  #num
3472 dc81 34 06               pshs d
3473 dc83 cc 00 04            ldd  #4
3474 dc86 ae f4               ldx  [,s]
3475 dc88 34 10               pshs x
3476 dc8a 5a                  decb
3477 dc8b 2d 06               blt  *+8
3478 dc8d 68 61               asl  1,s
3479 dc8f 69 e4               rol  ,s
3480 dc91 20 f7               bra  *-7
3481 dc93 35 06               puls d
3482 dc95 fd 70 1d            std  num
3483 dc98 cc 70 1d            ldd  #num
3484 dc9b 34 06               pshs d
3485 dc9d f6 70 09            ldb  key
3486 dca0 1d                  sex
3487 dca1 ae f4               ldx  [,s]
3488 dca3 34 10               pshs x
3489 dca5 aa e0               ora  ,s+
3490 dca7 ea e0               orb  ,s+
3491 dca9 fd 70 1d            std  num
3492 dcac fc 70 1d            ldd  num
3493 dcaf 34 06               pshs d
3494 dcb1 bd cc 8a            jsr hex4
3495 dcb4 32 62               leas 2,s
3496 dcb6 32 64               leas 4,s
3497 dcb8 39                  rts
3498
3499                         * .global key_copy
3500                         key_copy:
3501 dcb9 cc 00 05            ldd  #5
3502 dcbc f7 70 27            stb  state
3503 dcbf cc 00 00            ldd  #0
3504 dcc2 f7 70 0b            stb  hit
3505 dcc5 bd db dd            jsr clear_bu
3506 dcc8 cc 70 38            ldd  #buffer
3507 dccb 34 06               pshs d
3508 dccd cc 00 02            ldd  #2
3509 dcd0 e3 e1               addd ,s++
3510 dcd2 34 06               pshs d
3511 dcd4 cc 00 bd            ldd  #189
3512 dcd7 e7 f1               stb  [,s++]
3513 dcd9 cc 70 38            ldd  #buffer
3514 dcdc 34 06               pshs d
3515 dcde cc 00 00            ldd  #0
3516 dce1 e3 e1               addd ,s++
3517 dce3 34 06               pshs d
3518 dce5 cc 00 ae            ldd  #174
3519 dce8 e7 f1               stb  [,s++]
3520 dcea cc 70 38            ldd  #buffer
3521 dced 34 06               pshs d
3522 dcef cc 00 01            ldd  #1
3523 dcf2 e3 e1               addd ,s++
3524 dcf4 34 06               pshs d
3525 dcf6 cc 00 00            ldd  #0
3526 dcf9 e7 f1               stb  [,s++]
```

```
3527 dcfb 39                  rts
3528
3529                         * .global key_exe
3530                         key_exe:
3531 dcfc f6 70 0d            ldb  flag
3532 dcff 1d                  sex
3533 dd00 34 06               pshs d
3534 dd02 cc 00 00            ldd  #0
3535 dd05 10 a3 e1            cmpd ,s++
3536 dd08 27 05               beq  *+7
3537 dd0a cc 00 00            ldd  #0
3538 dd0d 20 03               bra  *+5
3539 dd0f cc 00 01            ldd  #1
3540 dd12 10 83 00 00         cmpd #0
3541 dd16 10 27 00 03         lbeq cc141
3542 dd1a bd de 82            jsr beep
3543                         cc141:
3544 dd1d f6 70 09            ldb  key
3545 dd20 1d                  sex
3546 dd21 34 06               pshs d
3547 dd23 cc 00 0f            ldd  #15
3548 dd26 10 a3 e1            cmpd ,s++
3549 dd29 2d 05               blt  *+7
3550 dd2b cc 00 00            ldd  #0
3551 dd2e 20 03               bra  *+5
3552 dd30 cc 00 01            ldd  #1
3553 dd33 10 83 00 00         cmpd #0
3554 dd37 10 27 00 b5         lbeq cc142
3555 dd3b f6 70 09            ldb  key
3556 dd3e 1d                  sex
3557 dd3f 7e dd ac            jmp cc145
3558                         cc146:
3559 dd42 bd ce 10            jsr key_addr
3560 dd45 7e dd ed            jmp cc144
3561                         cc147:
3562 dd48 bd ce 23            jsr key_data
3563 dd4b 7e dd ed            jmp cc144
3564                         cc148:
3565 dd4e bd ce 36            jsr key_plus
3566 dd51 7e dd ed            jmp cc144
3567                         cc149:
3568 dd54 bd cf 69            jsr key_minu
3569 dd57 7e dd ed            jmp cc144
3570                         cc150:
3571 dd5a bd d0 5b            jsr key_PC
3572 dd5d 7e dd ed            jmp cc144
3573                         cc151:
3574 dd60 bd d1 33            jsr key_go
3575 dd63 7e dd ed            jmp cc144
3576                         cc152:
3577 dd66 bd d2 c4            jsr key_reg
3578 dd69 7e dd ed            jmp cc144
3579                         cc153:
3580 dd6c bd d9 c5            jsr insert
3581 dd6f 7e dd ed            jmp cc144
3582                         cc154:
```

```
3583 dd72 bd da a1             jsr cut_byte
3584 dd75 7e dd ed             jmp cc144
3585                          cc155:
3586 dd78 f6 70 0d             ldb  flag
3587 dd7b 1d                   sex
3588 dd7c 34 06                pshs d
3589 dd7e cc 00 01             ldd  #1
3590 dd81 a8 e0                eora ,s+
3591 dd83 e8 e0                eorb ,s+
3592 dd85 f7 70 0d             stb  flag
3593 dd88 7e dd ed             jmp cc144
3594                          cc156:
3595 dd8b bd db 5a             jsr key_test
3596 dd8e 7e dd ed             jmp cc144
3597                          cc157:
3598 dd91 bd dc 27             jsr key_cal
3599 dd94 7e dd ed             jmp cc144
3600                          cc158:
3601 dd97 bd dc b9             jsr key_copy
3602 dd9a 7e dd ed             jmp cc144
3603                          cc159:
3604 dd9d bd e2 21             jsr key_dump
3605 dda0 7e dd ed             jmp cc144
3606                          cc160:
3607 dda3 bd e6 d0             jsr key_load
3608 dda6 7e dd ed             jmp cc144
3609 dda9 7e dd ed             jmp cc144
3610                          cc145:
3611 ddac bd c0 f9             jsr ccswitch
3612 ddaf dd 42 00 13          FDB cc146,19
3613 ddb3 dd 48 00 12          FDB cc147,18
3614 ddb7 dd 4e 00 17          FDB cc148,23
3615 ddbb dd 54 00 16          FDB cc149,22
3616 ddbf dd 5a 00 10          FDB cc150,16
3617 ddc3 dd 60 00 1b          FDB cc151,27
3618 ddc7 dd 66 00 11          FDB cc152,17
3619 ddcb dd 6c 00 18          FDB cc153,24
3620 ddcf dd 72 00 19          FDB cc154,25
3621 ddd3 dd 78 00 15          FDB cc155,21
3622 ddd7 dd 8b 00 1a          FDB cc156,26
3623 dddb dd 91 00 1d          FDB cc157,29
3624 dddf dd 97 00 1c          FDB cc158,28
3625 dde3 dd 9d 00 1e          FDB cc159,30
3626 dde7 dd a3 00 1f          FDB cc160,31
3627 ddeb 00 00                FDB 0
3628                          cc144:
3629 dded 7e de 45             jmp cc161
3630                          cc142:
3631 ddf0 f6 70 27             ldb  state
3632 ddf3 1d                   sex
3633 ddf4 7e de 24             jmp cc164
3634                          cc165:
3635 ddf7 bd d0 65             jsr hex_addr
3636 ddfa 7e de 45             jmp cc163
3637                          cc166:
3638 ddfd bd cf e6             jsr data_hex
```

```
3639 de00 7e de 45            jmp cc163
3640                         cc167:
3641 de03 bd d9 51            jsr reg_disp
3642 de06 7e de 45            jmp cc163
3643                         cc168:
3644 de09 bd dc 54            jsr enter_nu
3645 de0c 7e de 45            jmp cc163
3646                         cc169:
3647 de0f bd dc 54            jsr enter_nu
3648 de12 7e de 45            jmp cc163
3649                         cc170:
3650 de15 bd dc 54            jsr enter_nu
3651 de18 7e de 45            jmp cc163
3652                         cc171:
3653 de1b bd dc 54            jsr enter_nu
3654 de1e 7e de 45            jmp cc163
3655 de21 7e de 45            jmp cc163
3656                         cc164:
3657 de24 bd c0 f9            jsr ccswitch
3658 de27 dd f7 00 01         FDB cc165,1
3659 de2b dd fd 00 02         FDB cc166,2
3660 de2f de 03 00 03         FDB cc167,3
3661 de33 de 09 00 04         FDB cc168,4
3662 de37 de 0f 00 05         FDB cc169,5
3663 de3b de 15 00 06         FDB cc170,6
3664 de3f de 1b 00 07         FDB cc171,7
3665 de43 00 00               FDB 0
3666                         cc163:
3667                         cc161:
3668 de45 39                  rts
3669
3670                         * .global delay_be
3671                         delay_be:
3672 de46 cc 00 00            ldd  #0
3673 de49 fd 70 02            std  j
3674                         cc174:
3675 de4c fc 70 02            ldd  j
3676 de4f 34 06               pshs d
3677 de51 cc 00 02            ldd  #2
3678 de54 10 a3 e1            cmpd ,s++
3679 de57 2e 05               bgt  *+7
3680 de59 cc 00 00            ldd  #0
3681 de5c 20 03               bra  *+5
3682 de5e cc 00 01            ldd  #1
3683 de61 10 83 00 00         cmpd #0
3684 de65 10 27 00 18         lbeq cc173
3685 de69 7e de 7b            jmp cc175
3686                         cc172:
3687 de6c fc 70 02            ldd  j
3688 de6f c3 00 01            addd #1
3689 de72 fd 70 02            std  j
3690 de75 83 00 01            subd #1
3691 de78 7e de 4c            jmp cc174
3692                         cc175:
3693 de7b 7e de 6c            jmp cc172
3694 de7e 7e de 6c            jmp cc172
```

```
3695                         cc173:
3696 de81 39                  rts
3697
3698                         * .global beep
3699                         beep:
3700 de82 32 7f               leas -1,s
3701 de84 fc 70 40            ldd  port2
3702 de87 34 06               pshs d
3703 de89 cc 00 00            ldd  #0
3704 de8c e7 f1               stb  [,s++]
3705 de8e 31 e4               leay 0,s
3706 de90 1f 20               tfr  y,d
3707 de92 34 06               pshs d
3708 de94 cc 00 00            ldd  #0
3709 de97 e7 f1               stb  [,s++]
3710                         cc178:
3711 de99 31 e4               leay 0,s
3712 de9b 1f 20               tfr  y,d
3713 de9d 34 06               pshs d
3714 de9f e6 f1               ldb  [,s++]
3715 dea1 1d                  sex
3716 dea2 34 06               pshs d
3717 dea4 cc 00 3c            ldd  #60
3718 dea7 10 a3 e1            cmpd ,s++
3719 deaa 2e 05               bgt  *+7
3720 deac cc 00 00            ldd  #0
3721 deaf 20 03               bra  *+5
3722 deb1 cc 00 01            ldd  #1
3723 deb4 10 83 00 00         cmpd #0
3724 deb8 10 27 00 38         lbeq cc177
3725 debc 7e de d5            jmp cc179
3726                         cc176:
3727 debf 31 e4               leay 0,s
3728 dec1 1f 20               tfr  y,d
3729 dec3 34 06               pshs d
3730 dec5 34 06               pshs d
3731 dec7 e6 f1               ldb  [,s++]
3732 dec9 1d                  sex
3733 deca c3 00 01            addd #1
3734 decd e7 f1               stb  [,s++]
3735 decf 83 00 01            subd #1
3736 ded2 7e de 99            jmp cc178
3737                         cc179:
3738 ded5 fc 70 42            ldd  port1
3739 ded8 34 06               pshs d
3740 deda cc 00 80            ldd  #128
3741 dedd 43                  coma
3742 dede 53                  comb
3743 dedf e7 f1               stb  [,s++]
3744 dee1 bd de 46            jsr delay_be
3745 dee4 fc 70 42            ldd  port1
3746 dee7 34 06               pshs d
3747 dee9 cc 00 ff            ldd  #255
3748 deec e7 f1               stb  [,s++]
3749 deee bd de 46            jsr delay_be
3750 def1 7e de bf            jmp cc176
```

```
3751                         cc177:
3752 def4 32 61               leas 1,s
3753 def6 39                  rts
3754
3755                         * .global scan1
3756                         scan1:
3757                         cc180:
3758 def7 bd c8 84            jsr scan
3759 defa 34 06               pshs d
3760 defc cc 00 01            ldd  #1
3761 deff 43                  coma
3762 df00 53                  comb
3763 df01 c3 00 01            addd #1
3764 df04 10 a3 e1            cmpd ,s++
3765 df07 26 05               bne   *+7
3766 df09 cc 00 00            ldd  #0
3767 df0c 20 03               bra  *+5
3768 df0e cc 00 01            ldd  #1
3769 df11 10 83 00 00         cmpd #0
3770 df15 10 27 00 06         lbeq cc181
3771 df19 7e de f7            jmp cc180
3772 df1c 7e de f7            jmp cc180
3773                         cc181:
3774 df1f cc 00 03            ldd  #3
3775 df22 34 06               pshs d
3776 df24 bd c8 41            jsr delay_ms
3777 df27 32 62               leas 2,s
3778                         cc182:
3779 df29 bd c8 84            jsr scan
3780 df2c 34 06               pshs d
3781 df2e cc 00 01            ldd  #1
3782 df31 43                  coma
3783 df32 53                  comb
3784 df33 c3 00 01            addd #1
3785 df36 10 a3 e1            cmpd ,s++
3786 df39 27 05               beq  *+7
3787 df3b cc 00 00            ldd  #0
3788 df3e 20 03               bra  *+5
3789 df40 cc 00 01            ldd  #1
3790 df43 10 83 00 00         cmpd #0
3791 df47 10 27 00 06         lbeq cc183
3792 df4b 7e df 29            jmp cc182
3793 df4e 7e df 29            jmp cc182
3794                         cc183:
3795 df51 cc 00 03            ldd  #3
3796 df54 34 06               pshs d
3797 df56 bd c8 41            jsr delay_ms
3798 df59 32 62               leas 2,s
3799 df5b bd c8 84            jsr scan
3800 df5e f7 70 09            stb  key
3801 df61 f6 70 09            ldb  key
3802 df64 1d                  sex
3803 df65 34 06               pshs d
3804 df67 bd c3 0f            jsr key_code
3805 df6a 32 62               leas 2,s
3806 df6c f7 70 09            stb  key
```

```
3807 df6f bd dc fc            jsr key_exe
3808 df72 39                  rts
3809
3810                         * .global initacia
3811                         initacia:
3812 df73 32 7b               leas -5,s
3813 df75 31 62               leay 2,s
3814 df77 1f 20               tfr  y,d
3815 df79 34 06               pshs d
3816 df7b cc a0 00            ldd  #-24576
3817 df7e ed f1               std  [,s++]
3818 df80 31 e4               leay 0,s
3819 df82 1f 20               tfr  y,d
3820 df84 34 06               pshs d
3821 df86 cc 00 16            ldd  #22
3822 df89 e7 f1               stb  [,s++]
3823 df8b 31 61               leay 1,s
3824 df8d 1f 20               tfr  y,d
3825 df8f 34 06               pshs d
3826 df91 cc 00 03            ldd  #3
3827 df94 e7 f1               stb  [,s++]
3828 df96 31 62               leay 2,s
3829 df98 1f 20               tfr  y,d
3830 df9a 34 06               pshs d
3831 df9c ec f1               ldd  [,s++]
3832 df9e 34 06               pshs d
3833 dfa0 31 63               leay 3,s
3834 dfa2 1f 20               tfr  y,d
3835 dfa4 34 06               pshs d
3836 dfa6 e6 f1               ldb  [,s++]
3837 dfa8 1d                  sex
3838 dfa9 e7 f1               stb  [,s++]
3839 dfab 31 62               leay 2,s
3840 dfad 1f 20               tfr  y,d
3841 dfaf 34 06               pshs d
3842 dfb1 ec f1               ldd  [,s++]
3843 dfb3 34 06               pshs d
3844 dfb5 31 62               leay 2,s
3845 dfb7 1f 20               tfr  y,d
3846 dfb9 34 06               pshs d
3847 dfbb e6 f1               ldb  [,s++]
3848 dfbd 1d                  sex
3849 dfbe e7 f1               stb  [,s++]
3850 dfc0 31 64               leay 4,s
3851 dfc2 1f 20               tfr  y,d
3852 dfc4 34 06               pshs d
3853 dfc6 31 64               leay 4,s
3854 dfc8 1f 20               tfr  y,d
3855 dfca 34 06               pshs d
3856 dfcc ec f1               ldd  [,s++]
3857 dfce 34 06               pshs d
3858 dfd0 cc 00 01            ldd  #1
3859 dfd3 e3 e1               addd ,s++
3860 dfd5 34 06               pshs d
3861 dfd7 e6 f1               ldb  [,s++]
3862 dfd9 1d                  sex
```

```
3863 dfda e7 f1               stb  [,s++]
3864 dfdc 32 65               leas 5,s
3865 dfde 39                  rts
3866
3867                         * .global putchar
3868                         putchar:
3869 dfdf 32 7e               leas -2,s
3870 dfe1 31 e4               leay 0,s
3871 dfe3 1f 20               tfr  y,d
3872 dfe5 34 06               pshs d
3873 dfe7 cc a0 00            ldd  #-24576
3874 dfea ed f1               std  [,s++]
3875                         cc184:
3876 dfec 31 e4               leay 0,s
3877 dfee 1f 20               tfr  y,d
3878 dff0 34 06               pshs d
3879 dff2 ec f1               ldd  [,s++]
3880 dff4 34 06               pshs d
3881 dff6 e6 f1               ldb  [,s++]
3882 dff8 1d                  sex
3883 dff9 34 06               pshs d
3884 dffb cc 00 02            ldd  #2
3885 dffe a4 e0               anda ,s+
3886 e000 e4 e0               andb ,s+
3887 e002 34 06               pshs d
3888 e004 cc 00 00            ldd  #0
3889 e007 10 a3 e1            cmpd ,s++
3890 e00a 27 05               beq  *+7
3891 e00c cc 00 00            ldd  #0
3892 e00f 20 03               bra  *+5
3893 e011 cc 00 01            ldd  #1
3894 e014 10 83 00 00         cmpd #0
3895 e018 10 27 00 06         lbeq cc185
3896 e01c 7e df ec            jmp cc184
3897 e01f 7e df ec            jmp cc184
3898                         cc185:
3899 e022 31 e4               leay 0,s
3900 e024 1f 20               tfr  y,d
3901 e026 34 06               pshs d
3902 e028 ec f1               ldd  [,s++]
3903 e02a 34 06               pshs d
3904 e02c cc 00 01            ldd  #1
3905 e02f e3 e1               addd ,s++
3906 e031 34 06               pshs d
3907 e033 31 67               leay 7,s
3908 e035 1f 20               tfr  y,d
3909 e037 34 06               pshs d
3910 e039 e6 f1               ldb  [,s++]
3911 e03b 1d                  sex
3912 e03c e7 f1               stb  [,s++]
3913 e03e 32 62               leas 2,s
3914 e040 39                  rts
3915
3916                         * .global puts
3917                         puts:
3918                         cc186:
```

```
3919 e041 31 62               leay 2,s
3920 e043 1f 20               tfr  y,d
3921 e045 34 06               pshs d
3922 e047 ec f1               ldd  [,s++]
3923 e049 34 06               pshs d
3924 e04b e6 f1               ldb  [,s++]
3925 e04d 1d                  sex
3926 e04e 10 83 00 00         cmpd #0
3927 e052 10 27 00 29         lbeq cc187
3928 e056 31 62               leay 2,s
3929 e058 1f 20               tfr  y,d
3930 e05a 34 06               pshs d
3931 e05c ec f1               ldd  [,s++]
3932 e05e 34 06               pshs d
3933 e060 e6 f1               ldb  [,s++]
3934 e062 1d                  sex
3935 e063 34 06               pshs d
3936 e065 bd df df            jsr putchar
3937 e068 32 62               leas 2,s
3938 e06a 31 62               leay 2,s
3939 e06c 1f 20               tfr  y,d
3940 e06e 34 06               pshs d
3941 e070 34 06               pshs d
3942 e072 ec f1               ldd  [,s++]
3943 e074 c3 00 01            addd #1
3944 e077 ed f1               std  [,s++]
3945 e079 83 00 01            subd #1
3946 e07c 7e e0 41            jmp cc186
3947                         cc187:
3948 e07f 39                  rts
3949
3950                         * .global getchar
3951                         getchar:
3952 e080 32 7d               leas -3,s
3953 e082 31 e4               leay 0,s
3954 e084 1f 20               tfr  y,d
3955 e086 34 06               pshs d
3956 e088 cc a0 00            ldd  #-24576
3957 e08b ed f1               std  [,s++]
3958                         cc188:
3959 e08d 31 e4               leay 0,s
3960 e08f 1f 20               tfr  y,d
3961 e091 34 06               pshs d
3962 e093 ec f1               ldd  [,s++]
3963 e095 34 06               pshs d
3964 e097 e6 f1               ldb  [,s++]
3965 e099 1d                  sex
3966 e09a 34 06               pshs d
3967 e09c cc 00 01            ldd  #1
3968 e09f a4 e0               anda ,s+
3969 e0a1 e4 e0               andb ,s+
3970 e0a3 34 06               pshs d
3971 e0a5 cc 00 00            ldd  #0
3972 e0a8 10 a3 e1            cmpd ,s++
3973 e0ab 27 05               beq  *+7
3974 e0ad cc 00 00            ldd  #0
```

```
3975 e0b0 20 03                bra  *+5
3976 e0b2 cc 00 01             ldd  #1
3977 e0b5 10 83 00 00          cmpd #0
3978 e0b9 10 27 00 06          lbeq cc189
3979 e0bd 7e e0 8d             jmp cc188
3980 e0c0 7e e0 8d             jmp cc188
3981                          cc189:
3982 e0c3 31 62                leay 2,s
3983 e0c5 1f 20                tfr  y,d
3984 e0c7 34 06                pshs d
3985 e0c9 31 62                leay 2,s
3986 e0cb 1f 20                tfr  y,d
3987 e0cd 34 06                pshs d
3988 e0cf ec f1                ldd  [,s++]
3989 e0d1 34 06                pshs d
3990 e0d3 cc 00 01             ldd  #1
3991 e0d6 e3 e1                addd ,s++
3992 e0d8 34 06                pshs d
3993 e0da e6 f1                ldb  [,s++]
3994 e0dc 1d                   sex
3995 e0dd e7 f1                stb  [,s++]
3996 e0df 31 62                leay 2,s
3997 e0e1 1f 20                tfr  y,d
3998 e0e3 34 06                pshs d
3999 e0e5 e6 f1                ldb  [,s++]
4000 e0e7 1d                   sex
4001 e0e8 32 63                leas 3,s
4002 e0ea 39                   rts
4003
4004                          * .global newline
4005                          newline:
4006 e0eb cc 00 0a             ldd  #10
4007 e0ee 34 06                pshs d
4008 e0f0 bd df df             jsr putchar
4009 e0f3 32 62                leas 2,s
4010 e0f5 cc 00 0d             ldd  #13
4011 e0f8 34 06                pshs d
4012 e0fa bd df df             jsr putchar
4013 e0fd 32 62                leas 2,s
4014 e0ff 39                   rts
4015
4016                          * .global send_hex
4017                          send_hex:
4018 e100 31 63                leay 3,s
4019 e102 1f 20                tfr  y,d
4020 e104 34 06                pshs d
4021 e106 e6 f1                ldb  [,s++]
4022 e108 1d                   sex
4023 e109 34 06                pshs d
4024 e10b cc 00 04             ldd  #4
4025 e10e 5a                   decb
4026 e10f 2d 06                blt  *+8
4027 e111 64 e4                lsr  ,s
4028 e113 66 61                ror  1,s
4029 e115 20 f7                bra *-7
4030 e117 35 06                puls d
```

```
4031 e119 f7 70 05             stb  k
4032 e11c f6 70 05             ldb  k
4033 e11f 1d                   sex
4034 e120 34 06                pshs d
4035 e122 cc 00 0f             ldd  #15
4036 e125 a4 e0                anda ,s+
4037 e127 e4 e0                andb ,s+
4038 e129 f7 70 05             stb  k
4039 e12c f6 70 05             ldb  k
4040 e12f 1d                   sex
4041 e130 34 06                pshs d
4042 e132 cc 00 09             ldd  #9
4043 e135 10 a3 e1             cmpd ,s++
4044 e138 2d 05                blt  *+7
4045 e13a cc 00 00             ldd  #0
4046 e13d 20 03                bra  *+5
4047 e13f cc 00 01             ldd  #1
4048 e142 10 83 00 00          cmpd #0
4049 e146 10 27 00 15          lbeq cc190
4050 e14a f6 70 05             ldb  k
4051 e14d 1d                   sex
4052 e14e 34 06                pshs d
4053 e150 cc 00 37             ldd  #55
4054 e153 e3 e1                addd ,s++
4055 e155 34 06                pshs d
4056 e157 bd df df             jsr putchar
4057 e15a 32 62                leas 2,s
4058 e15c 7e e1 71             jmp cc191
4059                          cc190:
4060 e15f f6 70 05             ldb  k
4061 e162 1d                   sex
4062 e163 34 06                pshs d
4063 e165 cc 00 30             ldd  #48
4064 e168 e3 e1                addd ,s++
4065 e16a 34 06                pshs d
4066 e16c bd df df             jsr putchar
4067 e16f 32 62                leas 2,s
4068                          cc191:
4069 e171 31 63                leay 3,s
4070 e173 1f 20                tfr  y,d
4071 e175 34 06                pshs d
4072 e177 e6 f1                ldb  [,s++]
4073 e179 1d                   sex
4074 e17a 34 06                pshs d
4075 e17c cc 00 0f             ldd  #15
4076 e17f a4 e0                anda ,s+
4077 e181 e4 e0                andb ,s+
4078 e183 f7 70 05             stb  k
4079 e186 f6 70 05             ldb  k
4080 e189 1d                   sex
4081 e18a 34 06                pshs d
4082 e18c cc 00 09             ldd  #9
4083 e18f 10 a3 e1             cmpd ,s++
4084 e192 2d 05                blt  *+7
4085 e194 cc 00 00             ldd  #0
4086 e197 20 03                bra  *+5
```

```
4087 e199 cc 00 01            ldd  #1
4088 e19c 10 83 00 00         cmpd #0
4089 e1a0 10 27 00 15         lbeq cc192
4090 e1a4 f6 70 05            ldb  k
4091 e1a7 1d                  sex
4092 e1a8 34 06               pshs d
4093 e1aa cc 00 37            ldd  #55
4094 e1ad e3 e1               addd ,s++
4095 e1af 34 06               pshs d
4096 e1b1 bd df df            jsr putchar
4097 e1b4 32 62               leas 2,s
4098 e1b6 7e e1 cb            jmp cc193
4099                         cc192:
4100 e1b9 f6 70 05            ldb  k
4101 e1bc 1d                  sex
4102 e1bd 34 06               pshs d
4103 e1bf cc 00 30            ldd  #48
4104 e1c2 e3 e1               addd ,s++
4105 e1c4 34 06               pshs d
4106 e1c6 bd df df            jsr putchar
4107 e1c9 32 62               leas 2,s
4108                         cc193:
4109 e1cb 39                  rts
4110
4111                         * .global send_wor
4112                         send_wor:
4113 e1cc 31 62               leay 2,s
4114 e1ce 1f 20               tfr  y,d
4115 e1d0 34 06               pshs d
4116 e1d2 ec f1               ldd  [,s++]
4117 e1d4 34 06               pshs d
4118 e1d6 cc 00 08            ldd  #8
4119 e1d9 5a                  decb
4120 e1da 2d 06               blt  *+8
4121 e1dc 64 e4               lsr  ,s
4122 e1de 66 61               ror  1,s
4123 e1e0 20 f7               bra *-7
4124 e1e2 35 06               puls d
4125 e1e4 fd 70 17            std  temp16
4126 e1e7 fc 70 17            ldd  temp16
4127 e1ea 34 06               pshs d
4128 e1ec cc 00 ff            ldd  #255
4129 e1ef a4 e0               anda ,s+
4130 e1f1 e4 e0               andb ,s+
4131 e1f3 f7 70 05            stb  k
4132 e1f6 f6 70 05            ldb  k
4133 e1f9 1d                  sex
4134 e1fa 34 06               pshs d
4135 e1fc bd e1 00            jsr send_hex
4136 e1ff 32 62               leas 2,s
4137 e201 31 62               leay 2,s
4138 e203 1f 20               tfr  y,d
4139 e205 34 06               pshs d
4140 e207 ec f1               ldd  [,s++]
4141 e209 34 06               pshs d
4142 e20b cc 00 ff            ldd  #255
```

```
4143 e20e a4 e0                anda ,s+
4144 e210 e4 e0                andb ,s+
4145 e212 f7 70 05             stb  k
4146 e215 f6 70 05             ldb  k
4147 e218 1d                   sex
4148 e219 34 06                pshs d
4149 e21b bd e1 00             jsr send_hex
4150 e21e 32 62                leas 2,s
4151 e220 39                   rts
4152
4153                          * .global key_dump
4154                          key_dump:
4155 e221 32 7c                leas -4,s
4156 e223 fc 70 19             ldd  PC
4157 e226 fd 70 46             std  dptr
4158 e229 31 62                leay 2,s
4159 e22b 1f 20                tfr  y,d
4160 e22d 34 06                pshs d
4161 e22f cc 00 00             ldd  #0
4162 e232 ed f1                std  [,s++]
4163                          cc196:
4164 e234 31 62                leay 2,s
4165 e236 1f 20                tfr  y,d
4166 e238 34 06                pshs d
4167 e23a ec f1                ldd  [,s++]
4168 e23c 34 06                pshs d
4169 e23e cc 00 10             ldd  #16
4170 e241 10 a3 e1             cmpd ,s++
4171 e244 2e 05                bgt  *+7
4172 e246 cc 00 00             ldd  #0
4173 e249 20 03                bra  *+5
4174 e24b cc 00 01             ldd  #1
4175 e24e 10 83 00 00          cmpd #0
4176 e252 10 27 01 7a          lbeq cc195
4177 e256 7e e2 6e             jmp cc197
4178                          cc194:
4179 e259 31 62                leay 2,s
4180 e25b 1f 20                tfr  y,d
4181 e25d 34 06                pshs d
4182 e25f 34 06                pshs d
4183 e261 ec f1                ldd  [,s++]
4184 e263 c3 00 01             addd #1
4185 e266 ed f1                std  [,s++]
4186 e268 83 00 01             subd #1
4187 e26b 7e e2 34             jmp cc196
4188                          cc197:
4189 e26e bd e0 eb             jsr newline
4190 e271 fc 70 46             ldd  dptr
4191 e274 34 06                pshs d
4192 e276 bd e1 cc             jsr send_wor
4193 e279 32 62                leas 2,s
4194 e27b cc 00 3a             ldd  #58
4195 e27e 34 06                pshs d
4196 e280 bd df df             jsr putchar
4197 e283 32 62                leas 2,s
4198 e285 31 e4                leay 0,s
```

```
4199 e287 1f 20               tfr  y,d
4200 e289 34 06               pshs d
4201 e28b cc 00 00            ldd  #0
4202 e28e ed f1               std  [,s++]
4203                         cc200:
4204 e290 31 e4               leay 0,s
4205 e292 1f 20               tfr  y,d
4206 e294 34 06               pshs d
4207 e296 ec f1               ldd  [,s++]
4208 e298 34 06               pshs d
4209 e29a cc 00 10            ldd  #16
4210 e29d 10 a3 e1            cmpd ,s++
4211 e2a0 2e 05               bgt  *+7
4212 e2a2 cc 00 00            ldd  #0
4213 e2a5 20 03               bra  *+5
4214 e2a7 cc 00 01            ldd  #1
4215 e2aa 10 83 00 00         cmpd #0
4216 e2ae 10 27 00 40         lbeq cc199
4217 e2b2 7e e2 ca            jmp cc201
4218                         cc198:
4219 e2b5 31 e4               leay 0,s
4220 e2b7 1f 20               tfr  y,d
4221 e2b9 34 06               pshs d
4222 e2bb 34 06               pshs d
4223 e2bd ec f1               ldd  [,s++]
4224 e2bf c3 00 01            addd #1
4225 e2c2 ed f1               std  [,s++]
4226 e2c4 83 00 01            subd #1
4227 e2c7 7e e2 90            jmp cc200
4228                         cc201:
4229 e2ca fc 70 46            ldd  dptr
4230 e2cd 34 06               pshs d
4231 e2cf 31 62               leay 2,s
4232 e2d1 1f 20               tfr  y,d
4233 e2d3 34 06               pshs d
4234 e2d5 ec f1               ldd  [,s++]
4235 e2d7 e3 e1               addd ,s++
4236 e2d9 34 06               pshs d
4237 e2db e6 f1               ldb  [,s++]
4238 e2dd 1d                  sex
4239 e2de 34 06               pshs d
4240 e2e0 bd e1 00            jsr send_hex
4241 e2e3 32 62               leas 2,s
4242 e2e5 cc 00 20            ldd  #32
4243 e2e8 34 06               pshs d
4244 e2ea bd df df            jsr putchar
4245 e2ed 32 62               leas 2,s
4246 e2ef 7e e2 b5            jmp cc198
4247                         cc199:
4248 e2f2 cc 00 20            ldd  #32
4249 e2f5 34 06               pshs d
4250 e2f7 bd df df            jsr putchar
4251 e2fa 32 62               leas 2,s
4252 e2fc 31 e4               leay 0,s
4253 e2fe 1f 20               tfr  y,d
4254 e300 34 06               pshs d
```

```
4255 e302 cc 00 00            ldd  #0
4256 e305 ed f1               std  [,s++]
4257                         cc204:
4258 e307 31 e4               leay 0,s
4259 e309 1f 20               tfr  y,d
4260 e30b 34 06               pshs d
4261 e30d ec f1               ldd  [,s++]
4262 e30f 34 06               pshs d
4263 e311 cc 00 10            ldd  #16
4264 e314 10 a3 e1            cmpd ,s++
4265 e317 2e 05               bgt  *+7
4266 e319 cc 00 00            ldd  #0
4267 e31c 20 03               bra  *+5
4268 e31e cc 00 01            ldd  #1
4269 e321 10 83 00 00         cmpd #0
4270 e325 10 27 00 91         lbeq cc203
4271 e329 7e e3 41            jmp cc205
4272                         cc202:
4273 e32c 31 e4               leay 0,s
4274 e32e 1f 20               tfr  y,d
4275 e330 34 06               pshs d
4276 e332 34 06               pshs d
4277 e334 ec f1               ldd  [,s++]
4278 e336 c3 00 01            addd #1
4279 e339 ed f1               std  [,s++]
4280 e33b 83 00 01            subd #1
4281 e33e 7e e3 07            jmp cc204
4282                         cc205:
4283 e341 fc 70 46            ldd  dptr
4284 e344 34 06               pshs d
4285 e346 31 62               leay 2,s
4286 e348 1f 20               tfr  y,d
4287 e34a 34 06               pshs d
4288 e34c ec f1               ldd  [,s++]
4289 e34e e3 e1               addd ,s++
4290 e350 34 06               pshs d
4291 e352 e6 f1               ldb  [,s++]
4292 e354 1d                  sex
4293 e355 f7 70 07            stb  q
4294 e358 f6 70 07            ldb  q
4295 e35b 1d                  sex
4296 e35c 34 06               pshs d
4297 e35e cc 00 20            ldd  #32
4298 e361 10 a3 e1            cmpd ,s++
4299 e364 2f 05               ble  *+7
4300 e366 cc 00 00            ldd  #0
4301 e369 20 03               bra  *+5
4302 e36b cc 00 01            ldd  #1
4303 e36e 10 83 00 00         cmpd #0
4304 e372 10 27 00 21         lbeq cc207 ;_  instruction flagged for non o
4305 e376 f6 70 07            ldb  q
4306 e379 1d                  sex
4307 e37a 34 06               pshs d
4308 e37c cc 00 80            ldd  #128
4309 e37f 10 a3 e1            cmpd ,s++
4310 e382 2e 05               bgt  *+7
```

```
4311 e384 cc 00 00            ldd  #0
4312 e387 20 03               bra  *+5
4313 e389 cc 00 01            ldd  #1
4314 e38c 10 83 00 00         cmpd #0
4315 e390 10 27 00 03         lbeq cc207 ;_  instruction flagged for non o
4316 e394 cc 00 01            ldd  #1
4317                         cc207:
4318 e397 10 83 00 00         cmpd #0
4319 e39b 10 27 00 0e         lbeq cc206
4320 e39f f6 70 07            ldb  q
4321 e3a2 1d                  sex
4322 e3a3 34 06               pshs d
4323 e3a5 bd df df            jsr putchar
4324 e3a8 32 62               leas 2,s
4325 e3aa 7e e3 b7            jmp cc208
4326                         cc206:
4327 e3ad cc 00 2e            ldd  #46
4328 e3b0 34 06               pshs d
4329 e3b2 bd df df            jsr putchar
4330 e3b5 32 62               leas 2,s
4331                         cc208:
4332 e3b7 7e e3 2c            jmp cc202
4333                         cc203:
4334 e3ba cc 70 46            ldd  #dptr
4335 e3bd 34 06               pshs d
4336 e3bf cc 00 10            ldd  #16
4337 e3c2 ae f4               ldx  [,s]
4338 e3c4 34 10               pshs x
4339 e3c6 e3 e1               addd ,s++
4340 e3c8 fd 70 46            std  dptr
4341 e3cb 32 62               leas 2,s
4342 e3cd 7e e2 59            jmp cc194
4343                         cc195:
4344 e3d0 bd e0 eb            jsr newline
4345 e3d3 fc 70 46            ldd  dptr
4346 e3d6 fd 70 19            std  PC
4347 e3d9 bd ce 10            jsr key_addr
4348 e3dc 32 64               leas 4,s
4349 e3de 39                  rts
4350
4351                         * .global nibble2h
4352                         nibble2h:
4353 e3df 32 7f               leas -1,s
4354 e3e1 31 64               leay 4,s
4355 e3e3 1f 20               tfr  y,d
4356 e3e5 34 06               pshs d
4357 e3e7 e6 f1               ldb  [,s++]
4358 e3e9 1d                  sex
4359 e3ea 34 06               pshs d
4360 e3ec cc 00 40            ldd  #64
4361 e3ef 10 a3 e1            cmpd ,s++
4362 e3f2 2e 05               bgt  *+7
4363 e3f4 cc 00 00            ldd  #0
4364 e3f7 20 03               bra  *+5
4365 e3f9 cc 00 01            ldd  #1
4366 e3fc 10 83 00 00         cmpd #0
```

```
4367 e400 10 27 00 19         lbeq cc209
4368 e404 31 64               leay 4,s
4369 e406 1f 20               tfr  y,d
4370 e408 34 06               pshs d
4371 e40a e6 f1               ldb  [,s++]
4372 e40c 1d                  sex
4373 e40d 34 06               pshs d
4374 e40f cc 00 30            ldd  #48
4375 e412 35 10               puls x
4376 e414 34 06               pshs d
4377 e416 1f 10               tfr  x,d
4378 e418 a3 e1               subd ,s++
4379 e41a 32 61               leas 1,s
4380 e41c 39                  rts
4381                         cc209:
4382 e41d 31 64               leay 4,s
4383 e41f 1f 20               tfr  y,d
4384 e421 34 06               pshs d
4385 e423 e6 f1               ldb  [,s++]
4386 e425 1d                  sex
4387 e426 34 06               pshs d
4388 e428 cc 00 37            ldd  #55
4389 e42b 35 10               puls x
4390 e42d 34 06               pshs d
4391 e42f 1f 10               tfr  x,d
4392 e431 a3 e1               subd ,s++
4393 e433 32 61               leas 1,s
4394 e435 39                  rts
4395                         cc210:
4396 e436 32 61               leas 1,s
4397 e438 39                  rts
4398
4399                         * .global gethex
4400                         gethex:
4401 e439 32 7c               leas -4,s
4402 e43b 31 62               leay 2,s
4403 e43d 1f 20               tfr  y,d
4404 e43f 34 06               pshs d
4405 e441 bd e7 7a            jsr getchar2
4406 e444 ed f1               std  [,s++]
4407 e446 31 e4               leay 0,s
4408 e448 1f 20               tfr  y,d
4409 e44a 34 06               pshs d
4410 e44c bd e7 7a            jsr getchar2
4411 e44f ed f1               std  [,s++]
4412 e451 31 62               leay 2,s
4413 e453 1f 20               tfr  y,d
4414 e455 34 06               pshs d
4415 e457 31 64               leay 4,s
4416 e459 1f 20               tfr  y,d
4417 e45b 34 06               pshs d
4418 e45d ec f1               ldd  [,s++]
4419 e45f 34 06               pshs d
4420 e461 bd e3 df            jsr nibble2h
4421 e464 32 62               leas 2,s
4422 e466 34 06               pshs d
```

```
4423 e468 cc 00 04            ldd  #4
4424 e46b 5a                  decb
4425 e46c 2d 06               blt  *+8
4426 e46e 68 61               asl  1,s
4427 e470 69 e4               rol  ,s
4428 e472 20 f7               bra  *-7
4429 e474 35 06               puls d
4430 e476 ed f1               std  [,s++]
4431 e478 31 e4               leay 0,s
4432 e47a 1f 20               tfr  y,d
4433 e47c 34 06               pshs d
4434 e47e 31 62               leay 2,s
4435 e480 1f 20               tfr  y,d
4436 e482 34 06               pshs d
4437 e484 ec f1               ldd  [,s++]
4438 e486 34 06               pshs d
4439 e488 bd e3 df            jsr nibble2h
4440 e48b 32 62               leas 2,s
4441 e48d ed f1               std  [,s++]
4442 e48f 31 62               leay 2,s
4443 e491 1f 20               tfr  y,d
4444 e493 34 06               pshs d
4445 e495 31 64               leay 4,s
4446 e497 1f 20               tfr  y,d
4447 e499 34 06               pshs d
4448 e49b ec f1               ldd  [,s++]
4449 e49d 34 06               pshs d
4450 e49f 31 64               leay 4,s
4451 e4a1 1f 20               tfr  y,d
4452 e4a3 34 06               pshs d
4453 e4a5 ec f1               ldd  [,s++]
4454 e4a7 aa e0               ora  ,s+
4455 e4a9 ea e0               orb  ,s+
4456 e4ab ed f1               std  [,s++]
4457 e4ad fc 70 0f            ldd  bcc
4458 e4b0 34 06               pshs d
4459 e4b2 31 64               leay 4,s
4460 e4b4 1f 20               tfr  y,d
4461 e4b6 34 06               pshs d
4462 e4b8 ec f1               ldd  [,s++]
4463 e4ba e3 e1               addd ,s++
4464 e4bc fd 70 0f            std  bcc
4465 e4bf 31 62               leay 2,s
4466 e4c1 1f 20               tfr  y,d
4467 e4c3 34 06               pshs d
4468 e4c5 ec f1               ldd  [,s++]
4469 e4c7 32 64               leas 4,s
4470 e4c9 39                  rts
4471
4472                         * .global get16bit
4473                         get16bit:
4474 e4ca 32 7e               leas -2,s
4475 e4cc 31 e4               leay 0,s
4476 e4ce 1f 20               tfr  y,d
4477 e4d0 34 06               pshs d
4478 e4d2 cc 00 00            ldd  #0
```

```
4479 e4d5 ed f1               std  [,s++]
4480 e4d7 31 e4               leay 0,s
4481 e4d9 1f 20               tfr  y,d
4482 e4db 34 06               pshs d
4483 e4dd bd e4 39            jsr gethex
4484 e4e0 ae f4               ldx  [,s]
4485 e4e2 34 10               pshs x
4486 e4e4 aa e0               ora  ,s+
4487 e4e6 ea e0               orb  ,s+
4488 e4e8 ed f1               std  [,s++]
4489 e4ea 31 e4               leay 0,s
4490 e4ec 1f 20               tfr  y,d
4491 e4ee 34 06               pshs d
4492 e4f0 cc 00 08            ldd  #8
4493 e4f3 ae f4               ldx  [,s]
4494 e4f5 34 10               pshs x
4495 e4f7 5a                  decb
4496 e4f8 2d 06               blt  *+8
4497 e4fa 68 61               asl  1,s
4498 e4fc 69 e4               rol  ,s
4499 e4fe 20 f7               bra  *-7
4500 e500 35 06               puls d
4501 e502 ed f1               std  [,s++]
4502 e504 31 e4               leay 0,s
4503 e506 1f 20               tfr  y,d
4504 e508 34 06               pshs d
4505 e50a bd e4 39            jsr gethex
4506 e50d ae f4               ldx  [,s]
4507 e50f 34 10               pshs x
4508 e511 aa e0               ora  ,s+
4509 e513 ea e0               orb  ,s+
4510 e515 ed f1               std  [,s++]
4511 e517 31 e4               leay 0,s
4512 e519 1f 20               tfr  y,d
4513 e51b 34 06               pshs d
4514 e51d ec f1               ldd  [,s++]
4515 e51f 32 62               leas 2,s
4516 e521 39                  rts
4517
4518                         * .global read_rec
4519                         read_rec:
4520 e522 32 7c               leas -4,s
4521 e524 cc 00 00            ldd  #0
4522 e527 fd 70 0f            std  bcc
4523 e52a 31 62               leay 2,s
4524 e52c 1f 20               tfr  y,d
4525 e52e 34 06               pshs d
4526 e530 bd e4 39            jsr gethex
4527 e533 34 06               pshs d
4528 e535 cc 00 03            ldd  #3
4529 e538 35 10               puls x
4530 e53a 34 06               pshs d
4531 e53c 1f 10               tfr  x,d
4532 e53e a3 e1               subd ,s++
4533 e540 e7 f1               stb  [,s++]
4534 e542 31 e4               leay 0,s
```

```
4535 e544 1f 20               tfr  y,d
4536 e546 34 06               pshs d
4537 e548 bd e4 ca            jsr get16bit
4538 e54b ed f1               std  [,s++]
4539 e54d 31 e4               leay 0,s
4540 e54f 1f 20               tfr  y,d
4541 e551 34 06               pshs d
4542 e553 ec f1               ldd  [,s++]
4543 e555 fd 70 46            std  dptr
4544 e558 31 63               leay 3,s
4545 e55a 1f 20               tfr  y,d
4546 e55c 34 06               pshs d
4547 e55e cc 00 00            ldd  #0
4548 e561 e7 f1               stb  [,s++]
4549                         cc213:
4550 e563 31 63               leay 3,s
4551 e565 1f 20               tfr  y,d
4552 e567 34 06               pshs d
4553 e569 e6 f1               ldb  [,s++]
4554 e56b 1d                  sex
4555 e56c 34 06               pshs d
4556 e56e 31 64               leay 4,s
4557 e570 1f 20               tfr  y,d
4558 e572 34 06               pshs d
4559 e574 e6 f1               ldb  [,s++]
4560 e576 1d                  sex
4561 e577 10 a3 e1            cmpd ,s++
4562 e57a 2e 05               bgt  *+7
4563 e57c cc 00 00            ldd  #0
4564 e57f 20 03               bra  *+5
4565 e581 cc 00 01            ldd  #1
4566 e584 10 83 00 00         cmpd #0
4567 e588 10 27 00 33         lbeq cc212
4568 e58c 7e e5 a5            jmp cc214
4569                         cc211:
4570 e58f 31 63               leay 3,s
4571 e591 1f 20               tfr  y,d
4572 e593 34 06               pshs d
4573 e595 34 06               pshs d
4574 e597 e6 f1               ldb  [,s++]
4575 e599 1d                  sex
4576 e59a c3 00 01            addd #1
4577 e59d e7 f1               stb  [,s++]
4578 e59f 83 00 01            subd #1
4579 e5a2 7e e5 63            jmp cc213
4580                         cc214:
4581 e5a5 fc 70 46            ldd  dptr
4582 e5a8 34 06               pshs d
4583 e5aa 31 65               leay 5,s
4584 e5ac 1f 20               tfr  y,d
4585 e5ae 34 06               pshs d
4586 e5b0 e6 f1               ldb  [,s++]
4587 e5b2 1d                  sex
4588 e5b3 e3 e1               addd ,s++
4589 e5b5 34 06               pshs d
4590 e5b7 bd e4 39            jsr gethex
```

```
4591 e5ba e7 f1                stb  [,s++]
4592 e5bc 7e e5 8f             jmp cc211
4593                          cc212:
4594 e5bf fc 70 0f             ldd  bcc
4595 e5c2 43                   coma
4596 e5c3 53                   comb
4597 e5c4 fd 70 0f             std  bcc
4598 e5c7 fc 70 0f             ldd  bcc
4599 e5ca 34 06                pshs d
4600 e5cc cc 00 ff             ldd  #255
4601 e5cf a4 e0                anda ,s+
4602 e5d1 e4 e0                andb ,s+
4603 e5d3 fd 70 11             std  save_bcc
4604 e5d6 fc 70 11             ldd  save_bcc
4605 e5d9 34 06                pshs d
4606 e5db bd e4 39             jsr gethex
4607 e5de 10 a3 e1             cmpd ,s++
4608 e5e1 26 05                bne   *+7
4609 e5e3 cc 00 00             ldd  #0
4610 e5e6 20 03                bra  *+5
4611 e5e8 cc 00 01             ldd  #1
4612 e5eb 10 83 00 00          cmpd #0
4613 e5ef 10 27 00 06          lbeq cc215
4614 e5f3 cc 00 01             ldd  #1
4615 e5f6 fd 70 13             std  bcc_erro
4616                          cc215:
4617 e5f9 32 64                leas 4,s
4618 e5fb 39                   rts
4619
4620                          * .global get_s_re
4621                          get_s_re:
4622 e5fc cc 00 00             ldd  #0
4623 e5ff fd 70 21             std  end
4624 e602 cc 00 00             ldd  #0
4625 e605 fd 70 13             std  bcc_erro
4626                          cc216:
4627 e608 fc 70 21             ldd  end
4628 e60b 34 06                pshs d
4629 e60d cc 00 00             ldd  #0
4630 e610 10 a3 e1             cmpd ,s++
4631 e613 27 05                beq  *+7
4632 e615 cc 00 00             ldd  #0
4633 e618 20 03                bra  *+5
4634 e61a cc 00 01             ldd  #1
4635 e61d 10 83 00 00          cmpd #0
4636 e621 10 27 00 65          lbeq cc217
4637                          cc218:
4638 e625 bd e7 7a             jsr getchar2
4639 e628 34 06                pshs d
4640 e62a cc 00 53             ldd  #83
4641 e62d 10 a3 e1             cmpd ,s++
4642 e630 26 05                bne   *+7
4643 e632 cc 00 00             ldd  #0
4644 e635 20 03                bra  *+5
4645 e637 cc 00 01             ldd  #1
4646 e63a 10 83 00 00          cmpd #0
```

```
4647 e63e 10 27 00 06         lbeq cc219
4648 e642 7e e6 25            jmp cc218
4649 e645 7e e6 25            jmp cc218
4650                         cc219:
4651 e648 bd e7 7a            jsr getchar2
4652 e64b 7e e6 72            jmp cc222
4653                         cc223:
4654 e64e cc 00 00            ldd  #0
4655 e651 fd 70 21            std  end
4656 e654 7e e6 87            jmp cc221
4657                         cc224:
4658 e657 bd e5 22            jsr read_rec
4659 e65a 7e e6 87            jmp cc221
4660                         cc225:
4661 e65d cc 00 01            ldd  #1
4662 e660 fd 70 21            std  end
4663 e663 7e e6 87            jmp cc221
4664                         cc226:
4665 e666 cc 00 01            ldd  #1
4666 e669 fd 70 21            std  end
4667 e66c 7e e6 87            jmp cc221
4668 e66f 7e e6 87            jmp cc221
4669                         cc222:
4670 e672 bd c0 f9            jsr ccswitch
4671 e675 e6 4e 00 30         FDB cc223,48
4672 e679 e6 57 00 31         FDB cc224,49
4673 e67d e6 5d 00 35         FDB cc225,53
4674 e681 e6 66 00 39         FDB cc226,57
4675 e685 00 00               FDB 0
4676                         cc221:
4677 e687 7e e6 08            jmp cc216
4678                         cc217:
4679 e68a bd e0 eb            jsr newline
4680 e68d fc 70 13            ldd  bcc_erro
4681 e690 10 83 00 00         cmpd #0
4682 e694 10 27 00 0d         lbeq cc227
4683 e698 cc e6 b3            ldd  #cc1+0
4684 e69b 34 06               pshs d
4685 e69d bd e0 41            jsr puts
4686 e6a0 32 62               leas 2,s
4687 e6a2 7e e6 af            jmp cc228
4688                         cc227:
4689 e6a5 cc e6 c5            ldd  #cc1+18
4690 e6a8 34 06               pshs d
4691 e6aa bd e0 41            jsr puts
4692 e6ad 32 62               leas 2,s
4693                         cc228:
4694 e6af bd ce 23            jsr key_data
4695 e6b2 39                  rts
4696                         cc1:
4697 e6b3 63 68 65 63 6b 20   FCB 99,104,101,99,107,32,115,117,109,32
     73 75 6d 20
4698 e6bd 65 72 72 6f 72 73   FCB 101,114,114,111,114,115,33,0,48,32
     21 00 30 20
4699 e6c7 65 72 72 6f 72 2e   FCB 101,114,114,111,114,46,46,46,0
     2e 2e 00
```

```
4700
4701                         * .global key_load
4702                         key_load:
4703 e6d0 bd e0 eb            jsr newline
4704 e6d3 cc e6 e1            ldd  #cc229+0
4705 e6d6 34 06               pshs d
4706 e6d8 bd e0 41            jsr puts
4707 e6db 32 62               leas 2,s
4708 e6dd bd e5 fc            jsr get_s_re
4709 e6e0 39                  rts
4710                         cc229:
4711 e6e1 4c 6f 61 64 20 4d   FCB 76,111,97,100,32,77,111,116,111,114
     6f 74 6f 72
4712 e6eb 6f 6c 61 20 73 2d   FCB 111,108,97,32,115,45,114,101,99,111
     72 65 63 6f
4713 e6f5 72 64 20 28 73 65   FCB 114,100,32,40,115,101,116,32,49,109
     74 20 31 6d
4714 e6ff 73 20 64 65 6c 61   FCB 115,32,100,101,108,97,121,44,32,99
     79 2c 20 63
4715 e709 68 61 72 61 63 74   FCB 104,97,114,97,99,116,101,114,32,38
     65 72 20 26
4716 e713 20 6c 69 6e 65 29   FCB 32,108,105,110,101,41,0
     00
4717
4718                         * .global initreg
4719                         initreg:
4720 e71a cc 02 00            ldd  #512
4721 e71d fd 70 19            std  PC
4722 e720 cc 02 00            ldd  #512
4723 e723 fd 70 1b            std  save_PC
4724 e726 cc 7f 00            ldd  #32512
4725 e729 fd 70 2a            std  USER_U
4726 e72c cc 00 00            ldd  #0
4727 e72f f7 70 35            stb  USER_DP
4728 e732 1f a8                   TFR CC,A
4729 e734 b7 70 34                STA USER_P
4730 e737 cc 80 00            ldd  #-32768
4731 e73a fd 70 3e            std  gpio1
4732 e73d cc 80 03            ldd  #-32765
4733 e740 fd 70 40            std  port2
4734 e743 cc 80 02            ldd  #-32766
4735 e746 fd 70 42            std  port1
4736 e749 cc 80 01            ldd  #-32767
4737 e74c fd 70 44            std  port0
4738 e74f 39                  rts
4739
4740                         * .global wait1s
4741                         wait1s:
4742 e750 1c ef                  andcc #$ef
4743                         cc231:
4744 e752 f6 70 0e            ldb  tick
4745 e755 1d                  sex
4746 e756 34 06               pshs d
4747 e758 cc 00 64            ldd  #100
4748 e75b 10 a3 e1            cmpd ,s++
4749 e75e 2e 05               bgt  *+7
```

```
4750 e760 cc 00 00            ldd  #0
4751 e763 20 03               bra  *+5
4752 e765 cc 00 01            ldd  #1
4753 e768 10 83 00 00         cmpd #0
4754 e76c 10 27 00 03         lbeq cc232
4755 e770 7e e7 52            jmp cc231
4756                         cc232:
4757 e773 cc 00 00            ldd  #0
4758 e776 f7 70 0e            stb  tick
4759 e779 39                  rts
4760
4761                         * .global getchar2
4762                         getchar2:
4763 e77a 32 7d               leas -3,s
4764 e77c 31 e4               leay 0,s
4765 e77e 1f 20               tfr  y,d
4766 e780 34 06               pshs d
4767 e782 cc a0 00            ldd  #-24576
4768 e785 ed f1               std  [,s++]
4769 e787 31 e4               leay 0,s
4770 e789 1f 20               tfr  y,d
4771 e78b 34 06               pshs d
4772 e78d ec f1               ldd  [,s++]
4773 e78f 34 06               pshs d
4774 e791 cc 00 16            ldd  #22
4775 e794 e7 f1               stb  [,s++]
4776                         cc233:
4777 e796 31 e4               leay 0,s
4778 e798 1f 20               tfr  y,d
4779 e79a 34 06               pshs d
4780 e79c ec f1               ldd  [,s++]
4781 e79e 34 06               pshs d
4782 e7a0 e6 f1               ldb  [,s++]
4783 e7a2 1d                  sex
4784 e7a3 34 06               pshs d
4785 e7a5 cc 00 01            ldd  #1
4786 e7a8 a4 e0               anda ,s+
4787 e7aa e4 e0               andb ,s+
4788 e7ac 34 06               pshs d
4789 e7ae cc 00 00            ldd  #0
4790 e7b1 10 a3 e1            cmpd ,s++
4791 e7b4 27 05               beq  *+7
4792 e7b6 cc 00 00            ldd  #0
4793 e7b9 20 03               bra  *+5
4794 e7bb cc 00 01            ldd  #1
4795 e7be 10 83 00 00         cmpd #0
4796 e7c2 10 27 00 03         lbeq cc234
4797 e7c6 7e e7 96            jmp cc233
4798                         cc234:
4799 e7c9 31 e4               leay 0,s
4800 e7cb 1f 20               tfr  y,d
4801 e7cd 34 06               pshs d
4802 e7cf ec f1               ldd  [,s++]
4803 e7d1 34 06               pshs d
4804 e7d3 cc 00 56            ldd  #86
4805 e7d6 e7 f1               stb  [,s++]
```

```
4806 e7d8 31 62               leay 2,s
4807 e7da 1f 20               tfr  y,d
4808 e7dc 34 06               pshs d
4809 e7de 31 62               leay 2,s
4810 e7e0 1f 20               tfr  y,d
4811 e7e2 34 06               pshs d
4812 e7e4 ec f1               ldd  [,s++]
4813 e7e6 34 06               pshs d
4814 e7e8 cc 00 01            ldd  #1
4815 e7eb e3 e1               addd ,s++
4816 e7ed 34 06               pshs d
4817 e7ef e6 f1               ldb  [,s++]
4818 e7f1 1d                  sex
4819 e7f2 e7 f1               stb  [,s++]
4820 e7f4 fc 70 3e            ldd  gpio1
4821 e7f7 34 06               pshs d
4822 e7f9 31 64               leay 4,s
4823 e7fb 1f 20               tfr  y,d
4824 e7fd 34 06               pshs d
4825 e7ff e6 f1               ldb  [,s++]
4826 e801 1d                  sex
4827 e802 e7 f1               stb  [,s++]
4828 e804 31 62               leay 2,s
4829 e806 1f 20               tfr  y,d
4830 e808 34 06               pshs d
4831 e80a e6 f1               ldb  [,s++]
4832 e80c 1d                  sex
4833 e80d 32 63               leas 3,s
4834 e80f 39                  rts
4835
4836                         * .global main
4837                         main:
4838 e810 bd e7 1a            jsr initreg
4839 e813 fc 70 3e            ldd  gpio1
4840 e816 34 06               pshs d
4841 e818 cc 00 00            ldd  #0
4842 e81b e7 f1               stb  [,s++]
4843 e81d fc 70 40            ldd  port2
4844 e820 34 06               pshs d
4845 e822 cc 00 00            ldd  #0
4846 e825 e7 f1               stb  [,s++]
4847 e827 fc 70 42            ldd  port1
4848 e82a 34 06               pshs d
4849 e82c cc 00 ff            ldd  #255
4850 e82f e7 f1               stb  [,s++]
4851 e831 cc 00 00            ldd  #0
4852 e834 f7 70 0d            stb  flag
4853 e837 bd df 73            jsr initacia
4854 e83a bd e0 eb            jsr newline
4855 e83d cc e9 18            ldd  #cc230+0
4856 e840 34 06               pshs d
4857 e842 bd e0 41            jsr puts
4858 e845 32 62               leas 2,s
4859 e847 bd c2 28            jsr InitLcd
4860 e84a bd c2 28            jsr InitLcd
4861 e84d cc e9 35            ldd  #cc230+29
```

```
4862 e850 34 06               pshs d
4863 e852 bd c2 6b            jsr PutLCD
4864 e855 32 62               leas 2,s
4865 e857 cc 00 00            ldd  #0
4866 e85a 34 06               pshs d
4867 e85c cc 00 01            ldd  #1
4868 e85f 34 06               pshs d
4869 e861 bd c1 97            jsr goto_xy
4870 e864 32 64               leas 4,s
4871 e866 cc e9 49            ldd  #cc230+49
4872 e869 34 06               pshs d
4873 e86b bd c2 6b            jsr PutLCD
4874 e86e 32 62               leas 2,s
4875 e870 cc 70 38            ldd  #buffer
4876 e873 34 06               pshs d
4877 e875 cc 00 05            ldd  #5
4878 e878 e3 e1               addd ,s++
4879 e87a 34 06               pshs d
4880 e87c cc c1 0d            ldd  #convert
4881 e87f 34 06               pshs d
4882 e881 cc 00 06            ldd  #6
4883 e884 e3 e1               addd ,s++
4884 e886 34 06               pshs d
4885 e888 e6 f1               ldb  [,s++]
4886 e88a 1d                  sex
4887 e88b e7 f1               stb  [,s++]
4888 e88d cc 70 38            ldd  #buffer
4889 e890 34 06               pshs d
4890 e892 cc 00 04            ldd  #4
4891 e895 e3 e1               addd ,s++
4892 e897 34 06               pshs d
4893 e899 cc c1 0d            ldd  #convert
4894 e89c 34 06               pshs d
4895 e89e cc 00 08            ldd  #8
4896 e8a1 e3 e1               addd ,s++
4897 e8a3 34 06               pshs d
4898 e8a5 e6 f1               ldb  [,s++]
4899 e8a7 1d                  sex
4900 e8a8 e7 f1               stb  [,s++]
4901 e8aa cc 70 38            ldd  #buffer
4902 e8ad 34 06               pshs d
4903 e8af cc 00 03            ldd  #3
4904 e8b2 e3 e1               addd ,s++
4905 e8b4 34 06               pshs d
4906 e8b6 cc c1 0d            ldd  #convert
4907 e8b9 34 06               pshs d
4908 e8bb cc 00 00            ldd  #0
4909 e8be e3 e1               addd ,s++
4910 e8c0 34 06               pshs d
4911 e8c2 e6 f1               ldb  [,s++]
4912 e8c4 1d                  sex
4913 e8c5 e7 f1               stb  [,s++]
4914 e8c7 cc 70 38            ldd  #buffer
4915 e8ca 34 06               pshs d
4916 e8cc cc 00 02            ldd  #2
4917 e8cf e3 e1               addd ,s++
4918 e8d1 34 06               pshs d
4919 e8d3 cc c1 0d            ldd  #convert
4920 e8d6 34 06               pshs d
4921 e8d8 cc 00 09            ldd  #9
4922 e8db e3 e1               addd ,s++
4923 e8dd 34 06               pshs d
4924 e8df e6 f1               ldb  [,s++]
4925 e8e1 1d                  sex
4926 e8e2 e7 f1               stb  [,s++]
4927 e8e4 cc 70 38            ldd  #buffer
4928 e8e7 34 06               pshs d
4929 e8e9 cc 00 01            ldd  #1
4930 e8ec e3 e1               addd ,s++
4931 e8ee 34 06               pshs d
4932 e8f0 cc 00 00            ldd  #0
4933 e8f3 e7 f1               stb  [,s++]
4934 e8f5 cc 70 38            ldd  #buffer
4935 e8f8 34 06               pshs d
4936 e8fa cc 00 00            ldd  #0
4937 e8fd e3 e1               addd ,s++
4938 e8ff 34 06               pshs d
4939 e901 cc 00 00            ldd  #0
4940 e904 e7 f1               stb  [,s++]
4941                         cc235:
4942 e906 cc 00 01            ldd  #1
4943 e909 10 83 00 00         cmpd #0
4944 e90d 10 27 00 06         lbeq cc236
4945 e911 bd de f7            jsr scan1
4946 e914 7e e9 06            jmp cc235
4947                         cc236:
4948 e917 39                  rts
4949                         cc230:
4950 e918 36 38 30 39 20 4d   FCB 54,56,48,57,32,77,73,67,82,79
     49 43 52 4f
4951 e922 50 52 4f 43 45 53   FCB 80,82,79,67,69,83,83,79,82,32
     53 4f 52 20
4952 e92c 4b 49 54 20 32 30   FCB 75,73,84,32,50,48,50,48,0,54
     32 30 00 36
4953 e936 38 30 39 20 4d 49   FCB 56,48,57,32,77,73,67,82,79,80
     43 52 4f 50
4954 e940 52 4f 43 45 53 53   FCB 82,79,67,69,83,83,79,82,0,51
     4f 52 00 33
4955 e94a 32 6b 42 20 52 41   FCB 50,107,66,32,82,65,77,32,85,65
     4d 20 55 41
4956 e954 52 54 20 4c 43 44   FCB 82,84,32,76,67,68,0
     00
4957                           END
```

NOTE