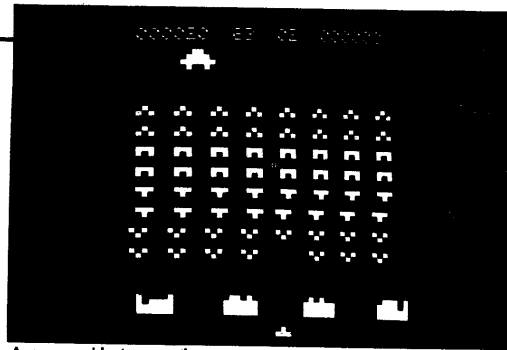


Software: Mike Rose.  
 Hardware: Paul Johnson  
 Development: Steve Ramsahadeo

## The 6502 software for this addictive and ever popular micro-game. Available in ROM for MICRON too!

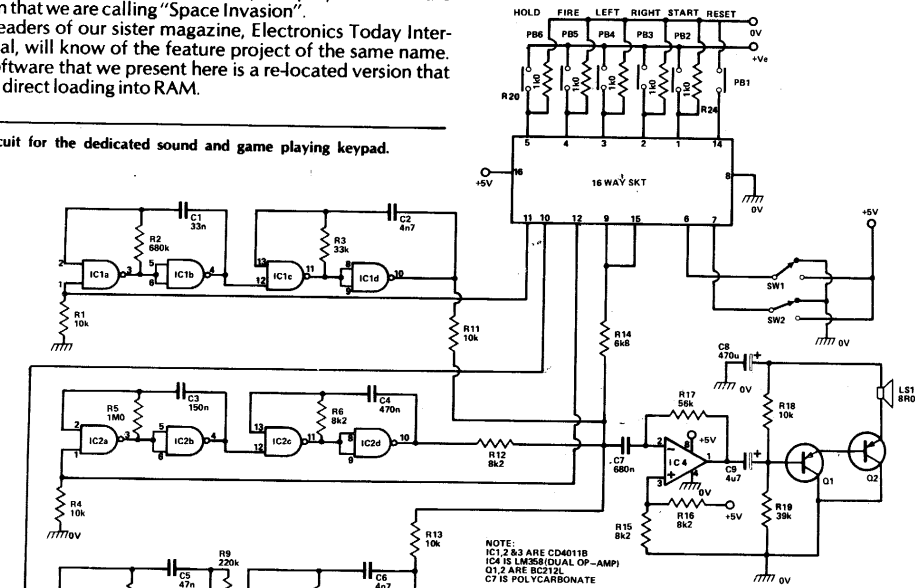
**I**nvasaders: a name that immediately conjures up images of queues in pubs and at motorway service stations where devotees spend hours (and small fortunes) blatting away at the massed ranks of weirdly shaped objects on a TV screen. Programs for "Invaders" type games have emerged for most of the common personal computers, so when we commissioned a new variant we decided to go for a new system, the Microtan 65. The game occupies 2K of memory and plays a full feature version that we are calling "Space Invasion".

Readers of our sister magazine, Electronics Today International, will know of the feature project of the same name. The software that we present here is a re-located version that allows direct loading into RAM.



A saucer widgets across the screen, current score 20, 63 saucers left and you only have two spare bases. Can you win?

The circuit for the dedicated sound and game playing keypad.



### Hardware Requirement

For the game listing given here you will need a Microtan 65 with either a Hex keypad or the special sound effects/keypad unit and at least 2K of RAM. Those fortunate enough to own either a MICRON or the Tanex expansion board can purchase a ROM direct from Tangerine Computer Systems which will plug directly into the ROM expansion area. Dedicated fans can then have their favourite game on tap 24 hours a day.

For DIY fans the following information will be of assistance. The game level is set by a binary code on pins 6 and 7 of the keyboard socket, "easy" is both low and "hardest" is both high with the two intermediate levels being logically coded between the two. The operating buttons are connected as follows: Reset-pin 14 to ground, Hold-pin 5 to Vcc, Fire-pin 4 to Vcc, Left-pin 3 to Vcc, Right-pin 2 to Vcc and Start-pin 1 to Vcc. Note that all control inputs except Reset are normally held low through 1k resistors.

The sound outputs are controlled by the following signals: Heartbeat-gated by a logic '1' on pin 12; Flying saucer-gated by a logic '1' on pin 10; Laser-gated by logic '0' on pin 11. All these

### Game Features

Among the major features of the game are the full screen scoring, the sound effects and the 'game hold' facility, but overall this ranks with the best pub and arcade games. The best way to give you the features is just to list them — so here goes:

- Four different sound effects
- Extra bases won every 2000 points with a maximum of four live bases at any time.
- Four levels of game difficulty
- Game hold facility
- Full screen scoring
- Flying saucer with bonus points
- Eight ranks of aliens.

# SPACE INVASION

sounds must be generated by an external oscillator system. The 'Explosion' sound is generated by the software and appears as a series of pulses on pin 9, the normal state is logic '0'. We have given a suggested circuit but there is nothing to stop you going your own way, except that you must remember not to load any of the signals either coming from or going to the main CPU board.

Those who do not wish to 'splash-out' on building a dedicated sound unit for the game can control the action from their Hex keypads in the following fashion. The movement keys 'Left' and 'Right' are keys 4 and 8 respectively, 'Fire' is key C, 'Play' is key 0, 'Hold' is key shift and 'Reset' is Reset. This layout was chosen to simplify use of the controls by just turning the keypad on its side. The difficulty factor can be 'rigged' by soldering links onto the underside of the keypad output socket.

## Software Notes

Because of the sheer size of the program we have presented it as a simple Hex dump but we have given a number of checks to simplify the loading. The program should be loaded in using the M command from address 0400H and it is probably wise to save small chunks of it as you go, there are over 4000 characters in the listing.

The format of the dump is arranged to simplify entry and follows the format below.

```
; 18 0400 4C300AA000F002A001A640B5804A088A4A4A4AAA28900A 0860
```

The first two characters give the number of Hex bytes in the line, the next four characters give the starting address of the line and then you have the pairs of Hex data bytes. At the end of the line is a checksum, this is a total of *all* the Hex information excluding itself. The final line of the dump contains 0,0, No. of records and a line checksum.

The second reason for publishing the Hex dump is that the program listing in fully commented and dis-assembled form takes 25 pages of A4 paper! This listing is available for those with other systems or those who wish to modify the game, at £3.50 from our normal office address by mail order *only*. The game uses no subroutines within the monitor other than the documented input and output segments, the only major change you will have to make is to alter the memory locations of the screen to suit your particular machine, which must obviously, be 6502 based.

The name "Space Invaders" is the copyright of Taito Electronics Ltd.

```

18 0400 4C300AA000F002A001A640B5804A088A4A4A4AAA28900A 0860
18 0418 B9CA068541BDCE06D0088DC20685418DC6068542A9008543 0AFC
17 0430 8544A640B5C02903AAF013464166434641664346426644 08DA
18 0447 46426644CADOEDA640B5804A4885C04A4AAAAB5188545B528 0BF0
18 045F 8546E8851885478528854868883023A8A54149FF31459145 0AD6
17 0477 A54349FF31479147C8A54249FF31459145A54449FF3147 0AFE
18 048E 91476048A640A55238F5C0C902B009A55138F580C9039023 0B9A
17 04A6 6A8A54111459145A54311479147C8A54211459145A544 09BF
18 048D 11479147B5C0D0034C050A60A90020670895C0AA68203A06 090B
18 04D5 60A5494AAAA9002AA8B9D20649FF30E0039DE003E8B9D406 0CA2
18 04ED 49FF30E0039DE00360A90A8549A5494AAAA9002AA8B9D206 0BC0
16 0505 30E003001BB9D40630E103D01389D20610E0039DE003 09D3
18 0518 B9D4065DE1039DE10360A205A000B559F006CA10F74C050A 0A64
16 0533 A5494A9001C838F55FD00FB56539D206F0E8A9FF9559 0BE3
18 0549 208B0760C9FFD0DCB56539D406D0EDF00320AC05A9008540 0CD8
17 0561 A54A854BA908854CA640A54B95C0A54C9580200304E640 0A3C
18 0578 A54C186906854CC93790E6A54838E904854BA540C94000D5 0BCC
17 0590 20F604A54AC9259012A21BA00689D6069DC003CA300588 0A24
18 05A7 10F430F060ADF0BF A2FFA0006901EAD0FB9D0002990003CA 0009
16 05BF C8D0F160A56EF002C66EE640A640E040F031B5C0F0F4 0EA2
17 05D5 200704A640F680A54D0004D680D680A54EF002D6C0B5C0 0CDA
18 05EC C901D00BA449C89838F580C9039004200304604C050AA900 0993
17 0604 854E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C
17 061B 80F190ACBD1F031D1F02D0098A38E920AAB0F1909BA540 0B3E
18 0632 4901854DE64ED091A4558A303581532556D005A900855260 0A1D
17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C
17 0661 8556A552C938B0DC A55338E9208553B002C654A5563153 0B39
18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78
17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A
18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984
18 06BF 4C45066070B0904050101080A0202090807060E080400000 0A14
18 06D7 000000FFFFFA00589590030048810F860B5C038E901484A 0AF6
17 06EF 4A99590085801869014A0980995F006829032AAABDDA07 0800
18 0706 996500604080102004080102A205B5591004CA10F9608459 078B

```

# SPACE INVASION

17	071E	B918008568B92800856CB55F08297F955FA8816B283029	08CC
18	0735	3565D006A9FF955930D9B16855659168A90016652A16652A	0A28
17	074D	F00F9565D659A56B18692085689002E66CA56CC904F005	0888
18	0764	B16B3565D008B16815659168D0A6B559000CB56529F0F006	0C2C
18	077C	208B074C3907B565516891684C18078A48984820D604A549	08B0
18	0794	4AAAA9002AA8BDE00348B9F9079DE003E8C8C8C00690EF8A	008A
18	07AC	48A905856BA2FF8AA8A56F29FD80F2BF4910856F880F0DCA	0E68
18	07C4	D0EDC66B00E7A901200108A56F29EF856F68AA689DDF0368	0C0C
18	07DC	90DE036890DD0320F604F838A53CE901853CB0034C050AD8	0B1A
18	07F4	68A868AA60240860900418A90F856BA2FF880F0ADF3BF0A	0CD4
17	080C	857E2902D007CAD0F0C66B00EA608DF38F8D61098570E8	0D48
18	0823	8D61098571A0FFC8E8BD6109F0049170D0F5ADF08F60A200	0DEE
17	083B	8C5F088DF38FB538484A4A4A4A186930992002C868290F	08ED
18	0852	6930992002C8E8E008D0DEF0D60806040C10181614488A48	095C
17	086A	4A4A4A4AAAF8A552C934B008188DB10865388538A53948	0A0D
17	0881	69008539A53A6900853A68453929E0F008A53CC904F002	0955
18	0898	E63CA552C934B00CA53B38E901853BD0034C7D0AD868AA68	0B44
17	08B0	6050403020A5784AAAA9002AA8E00E9068E033B064E012	0A9A
18	08C7	903FE02EB038B9340949FF3D30029D3002846BA57DF00CC8	0B00
16	08DF	984AB00E888888884CF108C8984A90F6C8C8C00A8011	0C4D
18	08F5	B934093D3002D01D8934091D30029D3002A468C8C8E8C00A	09CC
16	090D	90B6E678A57DD004C678C678602D6708A9008552A21F	0A72
18	0923	9D4002CA10FAA9008578A56F29F7856F60000B8203F7E74	0A2E
17	093B	8D0010C67AD01EC678D01AA905857BA91CA64D867DD002	0ABC
11	0952	A9638578A91E8579A56F0908856F60480206FD	
14	0963	494E564153494F4E20434F4D504C45544500890305EC	05EC
11	0977	505245535320504C4159204B455900490204C8	
17	0988	535041434520494E564153494F4E00910231303000D102	0692
14	099F	353000110334300051033330009103323000C303040C	040C
18	09B3	43542C4554492C28432954414E474552494E452031393830	06C8
18	09CB	00008802B83F7400CC021810000C031C14004C032C04008C	0524
18	09E3	032404000020AC05A225201A08E88D6109D0F7A26C201D08	0832
18	09FB	E88D6109D0F720FF0760A200D8201A08A210A90F9D6802CA	086F
18	0A13	10FA20FF07A202B53DD5389005002BCA10F5A202B538953D	0ACA
17	0A2B	CA10F9301DD8A900A2CF9530CAD0FBA20FA900A0029518	0B61
16	0A42	94281869209001C8CA10F3A2FF9A20E80978A930854A	0A51
16	0A58	205A05A214201A08A9008539853A8538A903853CA901	06E9
18	0A6E	8DF2BF20390820FF07ADF3BF4A9000A902200108A2FF089A	0C45
17	0A86	A964853BA905857B856FA001846D844F845088844D844E	0A7A
17	0A9D	845784528478845888A2059459CA10FB205A05A9FF8540	0B24
17	0AB4	C64AC64AA9FF457EA8880DFDC650D03320C305A9088550	0CE4
18	0ACB	203E09A56ED025A54ED021A5402907186938AAB5C0D0068A	0ABD
18	0AE3	38E90880F520DD06A67ABD300A297F653B4A856EC64FD031	0888
17	0AFB	E64FA0F38F2904F014A649E002F02220D604C64920FA04	08EB
18	0B12	A910854FD014ADF3BF2902F00DA649E03AF00720D604E649	0B56
17	0B2A	D0E3A201A552D03FADF3BF2908D008C6581048E658F047	0BFE
18	0B41	A558D043203E09A9038554A9E08553A649E886518A4A8555	0B1D
18	0B59	A56F29F8856FA90490010A8556A9028552A2008657CA300A	09D0
17	0B71	A56F0904856FA557D00B203A06A9068557A9028558C657	090F
18	0B88	ADF38F2910F018A0FFA9058DF2BFADF3BF2910D0F2880DF6	0F7E
16	0BA0	ADF38F290FF0F9C66DD00B201207A53B4A4A690A856D	0A61
18	0BB6	203908A56F8DF2BFA902C550001FC67CDD18A204A002A56F	0BC4
17	0BCE	2902F00A8888A56F4902856FA63B867C98056F856FA578	0A78
10	0BE5	F008C679D007A91E857920B5084CB80A07C1	
0	0	00590059	

N.B. The bomb rate can be reduced by changing 0AF1 to 3F and 0AF4 to EA.