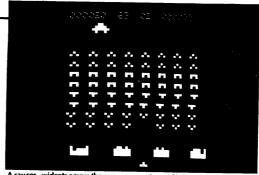
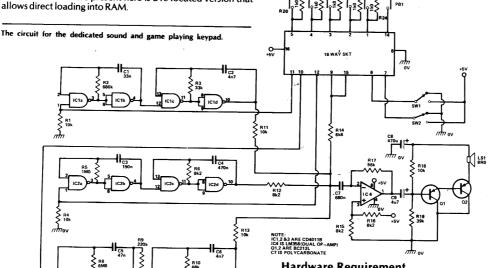
The 6502 software for this addictive and ever popular micro-game. Available in ROM for MICRON too!

nvaders: 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. 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?



Game Features

Eight ranks of aliens.

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

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

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 plus directly into the ROM expansion area. which will plug directly into the ROM expansion area.

Dedicated fans can then have their favourite game on tap 24 hours a day

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 codification. ed 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

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.

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 4C300AA000F002A001A640B5804A088A4A4A4A4AAAA28900A 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. $\label{eq:copyright}$

18 0418 BDCA068541BDCE06D008BDC2068541BDC6068542A9008543 OAFC 17 0430 8544A640B5C02903AAF013464166434641664346426644 OBDA 18 0447 46426644CAD0EDA640B5B004A48B5C04A4AAAB51885458528 OBFO 18 0457 8546E8B518B547852885486883023A8A54149FF31459145 OAD6 17 0477 A54349FF31479147C8A54249FF31459145A54449FF3147 OAFE 18 048E 91476048A640A55238F5C0C902B009A55138F580C9039023 OB9A 17 04A6 63ABA54111459145A54311479147C8A54211459145A5444 OBFE 18 048D 11479147B5C0D0034C05DA60A9002B0670895C0AA68203A06 OB9B 18 048D 60A5494AAAA9002AA8B9D20649FF3DE0039DE0038B9D406 OCA2 18 048D 49FF3DE0039DE00360A90A8549A5494AAAA9A002AA8B9D206 OBCD 16 0505 3DE003D01BB9D4063DE103D013B9D2061DE000339DE003 O9D3 18 051B B904065DE1039DE10360A205A000B559F006CA10F74C050A OA64 16 0533 A5494A9001CB38F55FD00FB56539D20GF0EA89FF9559 OBE3 17 0561 A54A654BA90B854CA64DA54B95CDA54C95802203A4E64D		0.400		
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17			A5494A9001C838F55FD00FB56539D206F0E8A9FF9559	0BE3
18 0578 A54C 186906854CC93790E6A54B38E904854BA540C940D0D5 DBCC 17 0590 20F604A54AC9259012A21BA006B9D6069DC003CA30058B DA24 18 05A7 10F430F060ADF0BFA2FFA0006901EAD0FB9D0002990003CA 0D09 16 05BF C8D0F160A56EF002C66EE640A640E040F031B5C0F0F4 0EA2 17 05D5 200704A640F680A54DD004D680D680A54EF002D6C0B5C0 0CDA 18 05EC C901D00BA449C89838F580C9039004200304604C050AA900 0993 17 0604 854E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C 17 061B B0F190ACBD1F031D1F02D0098A38E920AA80F1909BA54D DB3E 18 0632 4901854DE64ED091A4558A3035B1532556D005A900855260 0A 1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 DB3C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 18 0667 A55238F5C0EAEAC902B009A55138F580C903909CCA10E5 0B 1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540			20880760C9FFD0DCB56539D406D0EDF0D320AC05A9008540	0008
17 0590 20F604A54AC9259012A21BA006B9D6069DC003CA3005BB DA24 18 05A7 10F430F060ADF0BFA2FFA0006901EAD0FB9D0002990003CA 0D09 16 05BF CBD0F160A56EF002C66EE640A640E040F031B5C0F0F4 0EA2 17 05D5 200704A640F680A54DD004D680D680A54EF002D6C0B5C0 0CDA 18 05EC C901D00BA449C89838F580C9039004200304604C050AA900 0993 17 0604 854E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C 17 061B B0F190ACBD1F031D1F02D009BA38E920AAB0F1909BA54D DB3E 18 0632 4901B54DE64ED091A4558A3035B1532556D005A900855260 0A1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 DB3C 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 DB3C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 18 0687 A200F09FA540488640200704A640206708A90095C0688540 0984			A54A854BA908854CA640A54B95C0A54C9580200304E640	OA3C
18 05A7 10F430F060ADF0BFA2FFA0006901EAD0FB9D0002990003CA 0D09 16 05BF C8D0F160A56EF002C66EE640A640E040F031B5C0F0F4 0EA2 17 05D5 200704A640F680A54DD004D680D680A54EF002D6C0B5C0 0CDA 18 05EC C901D00BA449C89B3BF580C9039004200304604C050AA900 0993 17 0604 854E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C 17 061B 80F190ACBD1F031D1F02D009BA38E920AAB0F1909BA54D 0B3E 18 0632 4901B54DE64ED091A4558A3035B1532556D005A900855260 0A1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 18 0687 A200F09FA540488640200704A640206708A90095C0688540 0984			A54C186906854CC93790E6A54B38E904854BA540C940D0D5	OBCC
16 05BF C8D0F 160A 56EF 002C 66EE 640A 640E 040F 03 1B 5C 0F 0F 4 0EA2 17 05D5 200704A640F 680A 54DD004D680D680A 54EF 002D6C 0B5C0 0CDA 18 05EC C901D00BA449C89B38F 580C9039004200304604C050AA900 0993 17 0604 B54E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C 17 061B B0F190ACBD1F031D1F02D009BA38E920AAB0F1909BA54D 0B3E 18 0632 4901B54DE 64ED091A4556A3035B1532556D005A900855260 0A 1D 17 064A A55649FF31539153BAF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984			20F604A54AC9259012A21BA006B9D6069DC003CA300588	0A24
17 05D5 200704A640F680A54DD004D680D680A54EF002D6C0B5C0 OCDA 18 05EC C901D00BA449C89838F580C9039004200304604C050AA900 0993 17 0604 B54E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C 17 061B B0F190ACBD1F031D1F02D0098A38E920AAB0F1909BA54D 0B3E 18 0632 4901B54DE64ED091A4558A3035B1532556D005A900B55260 0A1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984			10F430F060ADF0BFA2FFA0006901EAD0FB9D0002990003CA	0009
18 05EC C901D00BA449C89838F580C9039004200304604C050AA900 0993 17 0604 854E8540A2E0A54DD011BD00031D0002D01A8A38E920AA 094C 17 0618 80F190ACBD1F031D1F02D0098A38E920AAB0F1909BA54D D83E 18 0632 4901854DE64ED091A4558A3035B1532556D005A900855260 0A 1D 17 064A A556649FF315391538AF0F0A900E65246566A46566AF013 D86C 17 0661 8556A552C938B0DCA55338E9208533B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984		05BF	C8D0F 160A 56EF 002C 66EE 640A 640E 040F 03 1B 5C 0F 0F 4	OEA2
17 0604 854E8540A2E0A540D011BD00031D0002D01A8A38E920AA 094C 17 0618 B0F190ACBD1F031D1F02D0098A38E920AAB0F1909BA54D DB3E 18 0632 4901854DE64ED091A4558A3035B1532556D005A900855260 0A1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984			200704A640F680A54DD004D680D680A54EF002D6C0B5C0	OCDA
17 0618 B0F190ACBD1F031D1F02D0098A38E920AAB0F1909BA54D DB3E 18 0632 4901854DE64ED091A4558A3035B1532556D005A900855260 0A1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984			C901D00BA449C89838F580C9039004200304604C050AA900	0993
18 0632 4901854DE 64E D091A4558A303581532556D005A900855260 0A 1D 17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E920853B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B 1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984		0604	854E854OA2EOA54DDO11BD00031D0002D01A8A38E92OAA	094C
17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 0B6C 17 0661 8556A552C938B0DCA55338E920853B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984	17	0618	BOF 190ACBD 1F031D1F02D0098A38E920AAB0F1909BA54D	083E
17 064A A55649FF315391538AF0F0A900E65246566A46566AF013 DB6C 17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984	18	0632	4901854DE64ED091A4558A3035B1532556D005A900855260	0A 1D
17 0661 8556A552C938B0DCA55338E9208553B002C654A5563153 0B39 18 0678 D007A5561153915360A652E03490034C1A09A23FB5C0F014 0A78 17 0690 A55238F5C0EAEAC902B009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984	17	064A	A55649FF315391538AF0F0A900E65246566A46566AF013	
17 0690 A55238F5C0EAEAC9028009A55138F580C9039007CA10E5 0B1A 18 06A7 A200F09FA540488640200704A640206708A90095C0688540 0984	17	0661	8556A552C938B0DCA55338E9208553B002C654A5563153	
18	18	0678	D007A5561153915360A652E03490034C1A09A23FB5C0F014	0A78
18	17	0690	A55238F5C0EAEAC9028009A55138F580C9039007CA10E5	08 1A
	18	06A7	A200F09FA540488640200704A640206708A90095C0688540	0984
	18	06BF	4C4506607080904050101080A0202090807060E08040D000	OA 14
18 06D7 000000FFFFFFA00589590030048810F86085C038E901484A 0AF6	18	06D7		
17 06EF 4A995900B5801869014A0980995F006829032AAABD0A07 0800	17	06EF		0800
18 0706 996500604080102004080102A205B5591004CA10F960B459 078B	18	0706	996500604080102004080102A205B5591004CA10F960B459	0788

SPACE INVASION

1			
١.,			
13	· · -	B91800856BB92800856CB55F08297F955FA8B16B283029	0800
18		3565D006A9FF955930D9B16B5565916BA90016652A16652A	0A28
113		F00F9565D659A56B186920856B9002E66CA56CC904F0D5	0888
118		B 16B3565D 008B 16B 15659 16BD 0A6B559D00CB56529F 0F 006	0020
18		208B074C3907B565516B916B4C18078A48984820D604A549	0880
18		4AAAA 9002AA 8BDE 00348B 9F 9079DE 003E 8C 8C 8C 00690EF 8A	0D 8A
18		48A9O5856BA2FF8AA8A56F29FD8DF2BF4910856F88D0FDCA	0E 68
18		DOEDC 66BD 0E 7A 90 1200 108A 56F 29E F 856F 68AA 689DDF 0368	OCDC
18		9DDE 03689DDD 0320F 604F 838A 53CE 901853CB 0034C 050AD8	OR 1A
18	,,	68A 868AA 60240860900418A 90F 856BA 2FF 88D 0FDADF 3BF 0A	OCD 4
18		857E2902D007CAD0F0C66BD0EA608DF3BFBD61098570E8	0D48
17		BD61098571A OFFC 8E 8BD6109F 0049170D 0F 5ADF 0BF60A200	ODEE
18		BC 5F 088DF 3BFB 538484A 4A 4A 4A 186930992002C868290F	08ED
17		6930992002C8E8E008D0DEF0D60806040C10181614488A48	095C
17		4A 4A 4A 4A AA F 8A 552C 934B 008 18B DB 108653B 853B A 53948	OA OD
18		69008539A53A6900853A68453929E0F008A53CC904F002	0955
12		E63CA552C934B00CA53B38E901853BD0034C7D0AD868AA68	0844
18		6050403020A5784AAAA9002AA8E00E9068E033B064E012	0A 9A
16		903FE 02EB 03BB 9340949FF 3D 30029D 3002846BA 57DF 00CC 8	0800
18		984AB 00E 88888884CF 108C 8984A 90F 6C 8C 8C 00AB 011	OC 4D
16		B934093D3002D01DB934091D30029D3002A46BC8C8E8C00A	0900
18		908 6E 678A 570D 004C 678C 67860206708A 9008552A 21F	0A 72
12		904002CA 10FAA 9008578A 56F 29F 7856F 6000008 8203F 7E 74 BD0010C 67AD01EC 67BD01AA 905857BA 91CA 64D 867DD002	DAZE
11	0952		OABC
14	0963	40.45.00.4.00.40.45.45.00.45.45.45.45.45.45.45.45.45.45.45.45.45.	
111	0977		
12	0988	535041434520494E564153494F4E00910231303000D102	òcoo
14	099F	000000110001000001000000000000000000000	0692
18	09B3	43542C4554492C28432954414E474552494E452O31393830	0608
18	09CB	00008B02B83F7400CC021810000C031C14004C032C04008C	0524
18	09E 3	032404000020AC05A225201A08E8BD6109D0F7A26C201D08	0832
18	09FB	E8BD6109D0F720FF0760A200D8201A08A210A90F9D6802CA	086F
18	DA 13	10FA20FF07A202B53DD53B9005D02BCA10F5A202B53B953D	DACA
17	DA2B	CA 10F9301DD8A900A2CF9530CAD0FBA20FA900A0029518	0861
16	0A42	94281869209001C8CA10F3A2FF9A20E80978A930854A	DA51
16	0a58	205A05A214201A08A9008539853A8538A903853CA901	06E9
18	DA6E	8DF2BF20390820FF07ADF3BF4A90D0A902200108A2FFD89A	0045
17	DA 86	A9648538A905857B856FA001846D844F845088844D844E	0A 7A
17	DA9D	845784528478845888A2059459CA10FB205A05A9FF8540	0B24
17	DAB4	C64AC64AA9FF457EAB8BD0FDC650D03320C305A9088550	OCE4
18	DACB	203E09A56E0025A54ED021A5402907186938AAB5C0D0068A	OA 8D
18	DAES	38E908B0F520DD06A67ABD300A297F653B4A856EC64FD031	0888
17	OAFB	E64FADF3BF2904F014A649E002F02220D604C64920FA04	OBEB
18	0812	A910854FD014ADF3BF2902F00DA649E03AF00720D604E649	0B56
17	0B2A	D0E3A201A552D03FADF3BF2908D008C658104BE658F047	OBFE
18	0841	A558D043203E09A9038554A9E08553A649E886518A4A8555	0B 1D
18 17	0859	A56F29F8856FA90490010A8556A9028552A2008657CA300A	0900
18		A56F 0904856F A557000B 203A 06A 906B 557A 902B 55B C 657	090F
16	0888	ADF3BF2910F018A0FFA9058DF2BFADF3BF2910D0F288D0F6	OF 7E
18	08A0	ADF3BF290FF0F9C66DD00B201207A53B4A4A690A856D	DA61_
17	0886	203908A56F8DF2BFA902C550D01FC67CD01BA204A002A56F	OBC4
10	08CE 08E5	2902F00A8888A56F4902856FA63B867C98056F856FA578	0A78
ľ	0	F00BC679D007A91E857920B5084CB8DA 07C1	1
۱ĭ	J	0059 0059	
1		N.B. The bomb rate can be reduced by changing 0AF1 to 3F and 0AF4 to EA.	
		Table 10 and 10	