

'DREAM INVADERS'

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Memory requirements: 2K (0800)
Loading address: 0200 - 0700
Run address: 0200 (Not C000)

Controls: Move gun-turret LEFT: key 0, (4, 8 or C)
Move gun-turret RIGHT: key 1, (5, 9 or D)
FIRE photon missile: key 3, (7, B or F)

Game ends if (a) all four guns get zapped, or
(b) an alien gets down to the bottom row (6th row).

Scoring:

10 points are scored for each alien exterminated. There are 24 aliens per round. Internal arithmetic is 8 bits, so maximum score is $250 \times 10 = 2500$, at which point the score (and level of difficulty) freezes; but you'll never get to 2500 unless you're superhuman! Beyond 2500, the number of rounds played continues to be counted. The score is displayed after each completed round, and whenever the aliens score a turret hit. Also shown is the current round (on the left) and number of gun-turrets remaining. Player gets a bonus of 2 new guns at the end of round 10!

Miscellaneous:

Game speed increases as the game progresses; starting off fairly tame, but getting frantic towards round 8! The rate at which aliens tend to drop to a lower level also increases; beware when one gets onto the 5th row! (Hint: Many events which appear to be random are not, but in fact are more or less under the control of the player!) The aliens also step up the number of missiles they use, at round 3, and again at round 6. There are no shields, so you must rely on your skill at dodging and develop a strategy to avoid being annihilated! Game can be restarted by pressing any key (after 4 second delay).

Checksum:

A short Checksum Verify program is provided to check that your Invaders program loaded from tape without error. Key in and run this routine at 0700. It only takes a fraction of a second to run. Then use 'memory modify' to examine location 00FF; it should contain AA. If it does, there is a 99.6% probability that your program loaded without error.

DREAM INVADERS has been thoroughly debugged and tuned, and exhaustively tested (by eager Space Invaders addicts) so as to ensure you many long hours of enjoyment. If the program appears to be misbehaving on your system, then either it did not load correctly (which can be checked, as above), or your system has a hardware fault. Note: adjustment to the tape demodulator trimpot may be necessary to effect a successful load.

CHECKSUM VERIFIER

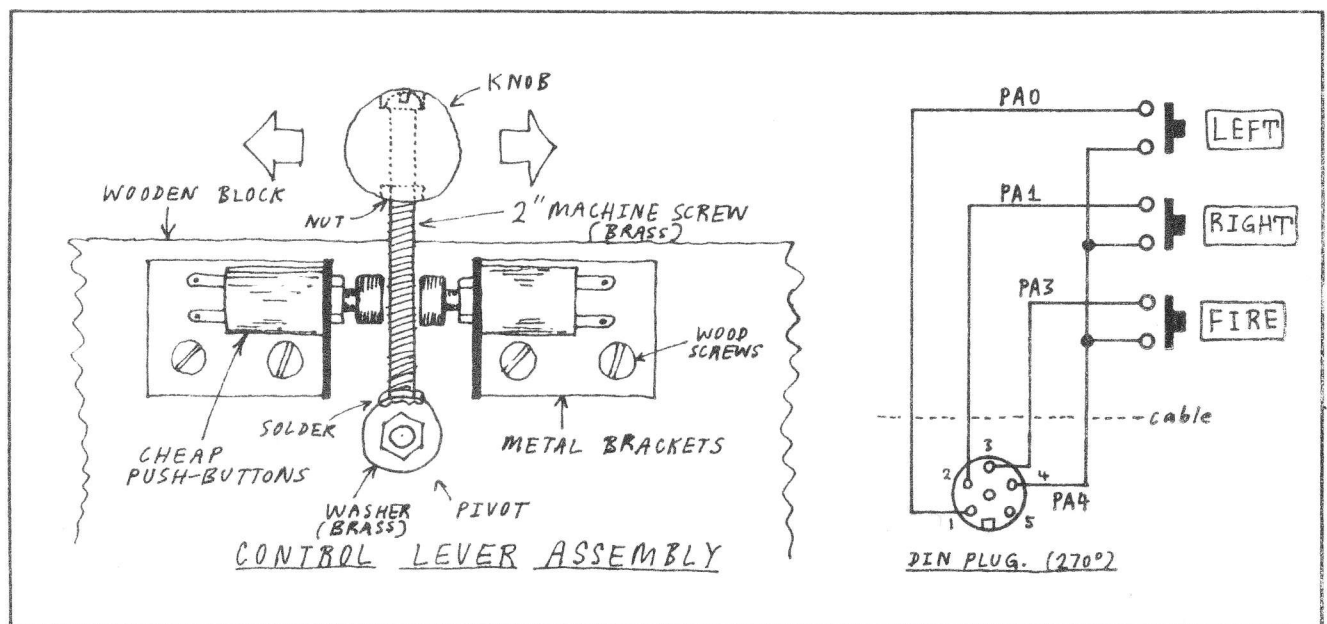
This little program is used to check that data in a given memory block (in this case, 0200 - 0700) has been correctly loaded. All it does is to add all the bytes together, without carry, and the 8-bit result is stored in a certain RAM location, namely 00FF. This result should be AA in the case of DREAM INVADERS. It is highly recommended that you run the verifier after the first attempt at loading INVADERS. Note that the starting address of the verifier is \$0700 (not C000).

* CHECKSUM VERIFY ROUTINE:

0700		ORG	\$0700
0700 CE 0200	VERIFY	LDX	#\$0200
0703 4F		CLR A	
0704 E6 00	VER1	LDA B	X
0706 1B		ABA	
0707 0B		INX	
070B BC 0700		CPX	#\$0700
070B 26 F7		BNE	VER1
070D 97 FF		STA A	\$00FF
070F 7E C360		JMP	\$C360

LEVER AND PUSH-BUTTON CONTROLS

To avoid wear and tear on your keyboard, I recommend that you construct a heavy-duty control-lever and fire-button assembly on a lump of 4-by-2! The buttons are wired in parallel with key-switches (0), (1) and (3). They will not interfere with keypad operation because they are normally open. For ultra-reliability, you could use microswitches.



2K RAM EXPANSION FOR THE DREAM-6800

Important Notes:

It is highly recommended to wire 8 x 10k pullup resistors from the data lines (D0 - D7) to Vcc (+5V), on the DREAM board; (see diagram).

A 2.2k pullup resistor is required on R/W, as shown, since VMA is not used.

REMOVE RAM CHIPS FROM THE DREAM BOARD; to be installed later in expander board.

Never remove or replace the expander board with power applied.

GND and Vcc leads should be connected first on installation (before bus leads).

Ground yourself and your work (via a 1M resistor) to avoid static discharge damage.

Construction Hints:

Fabricate the circuit on Vero 'DIP Board' (No. 200-21084E) or similar.

Use sockets for all ICs. Place 0.1uF ceramic bypass capacitors near the 2114s.

Use two ribbon cables (4" to 6" long), terminated at each end with 16-pin DIL plugs, to connect the expander board to the DREAM board. These can be purchased already made up. The DIL plugs on the expander board end should be soldered in (i.e. not socketed) to ensure reliability and to save 2 sockets.

Take extra special precautions not to get Vcc and GND reversed! The use of a polarized 2-pin plug and socket is highly recommended to avoid catastrophe.

Use fine hookup wire for interconnections on the expander board; 30 gauge 'Kynar' wire-wrap wire is ideal. Cut wires about 1/2 cm longer than the direct point-to-point distance; you'll end up with a mess if they are too short or too long. Be careful not to nick the wire when stripping insulation and avoid bending the wires at the joints too often. Use solder sparingly; don't make blobs!

The signal \overline{WE} (memory Write Enable) is not available on the bus connectors, so it is necessary to sacrifice one that is. It so happens that \overline{IRQ} is pretty useless, so we'll use pin-10 for \overline{WE} . Cut the PCB track at pin 10 on the lower bus socket. Wire a link from IC10 (74LS10) pin-12 (\overline{WE}) to the bus connector pin-10.

Testing

First, test your expanded system using 'memory modify'. Try reading and writing a few locations at random. If the computer appears to be working at all, that's a very good sign! You should be able to deposit and examine data from 0100 to 0800, but from 0800 to 2000 you should get 'FF', indicating no RAM present.

If that works OK, you might like to try the memory check program in the CHIPOS manual, if you have one. This program can be improved to provide an audio bleep after each successful scan of the block under test; as follows:-

022C	BD C2DF	JSR	BLEEP
022F	7E 0203	JMP	OVER

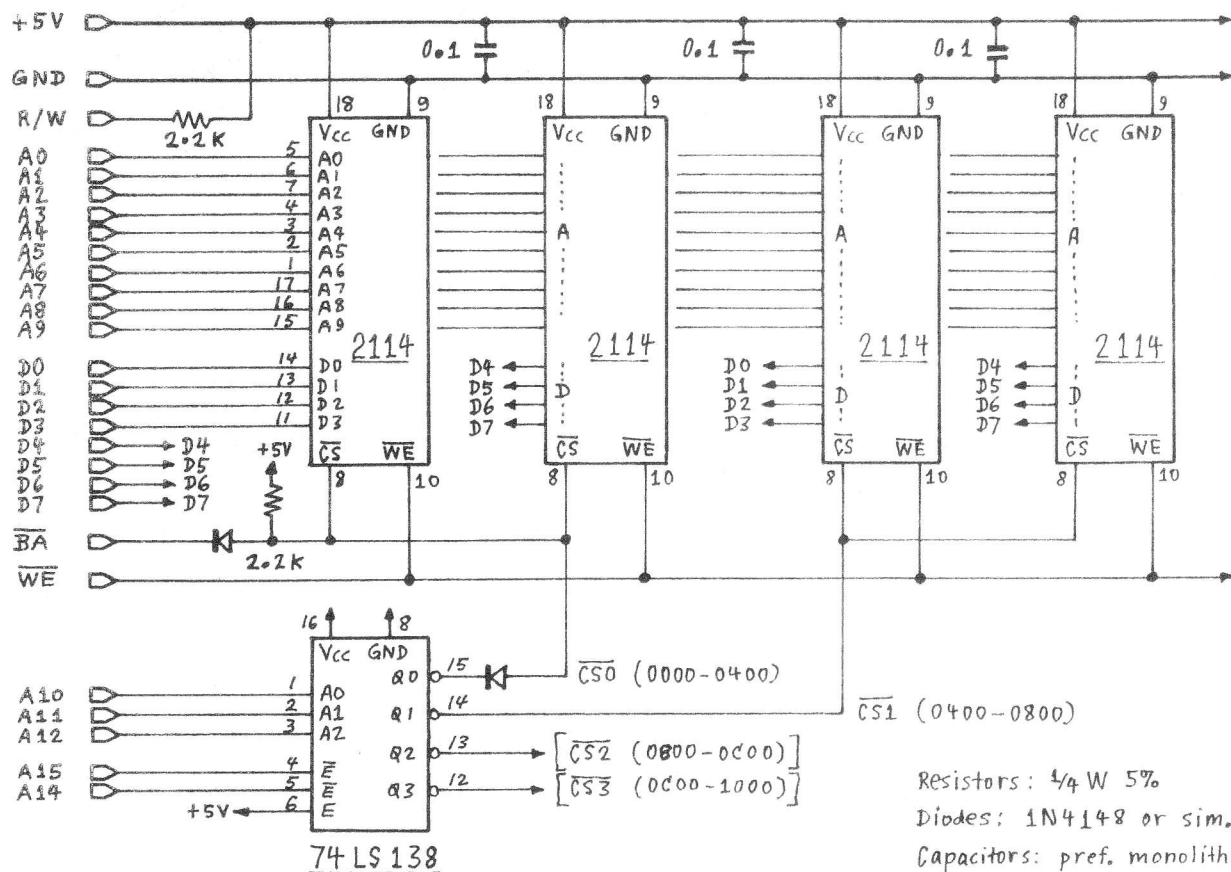
Note that DREAMBUG is required with the memory check, so that if a RAM fault occurs, a register dump will be displayed so you can figure out what went wrong! Check the block starting at 0280, ending at 0800.

If you have a malfunction, carefully check over your wiring. With ICs removed, use a multimeter (on ohms x 1) to check for shorts and continuity. The RAM chips can be tested in the DREAM board, without the expander board connected. Another useful test is to run the DREAM board (with its 1K), with the expander board EMPTY (i.e. all ICs, incl. 741s138, removed). If it doesn't work, you know for sure there's a wiring error somewhere!

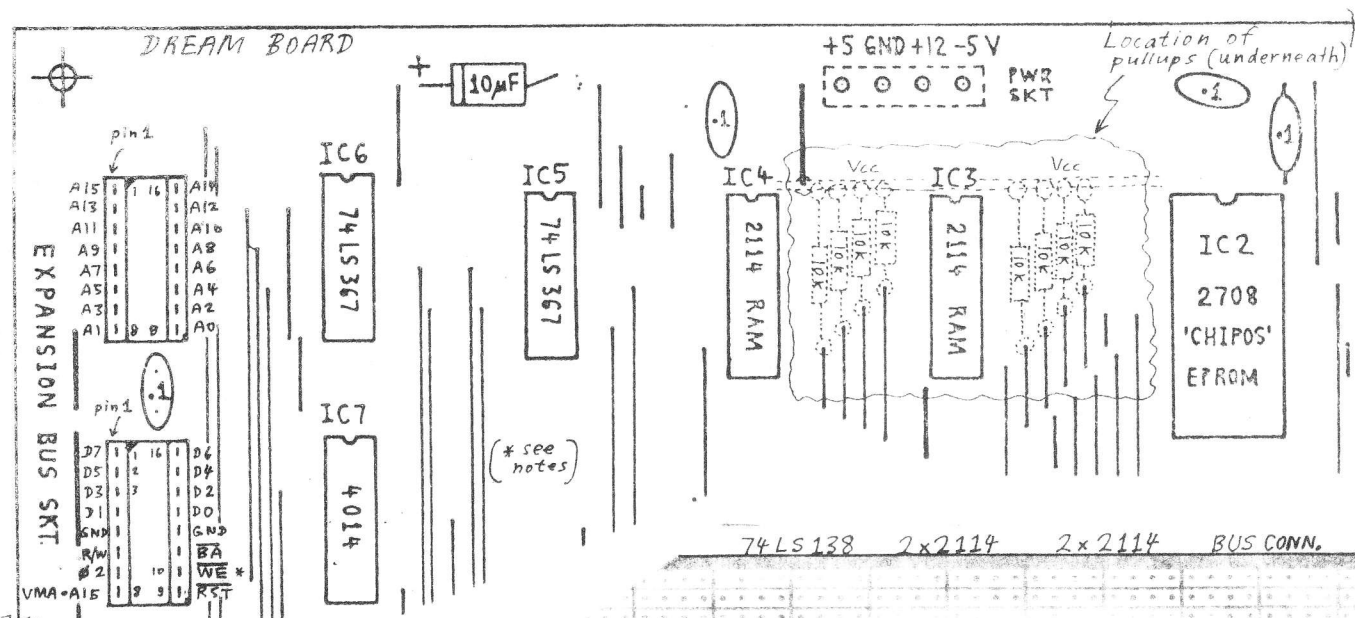
Addendum:

The December '80 issue of E.A. contains details of a 4K RAM expander PCB design. Many of the above notes will also be applicable to that design.

2K - 4K RAM EXPANSION FOR THE DREAM-6800

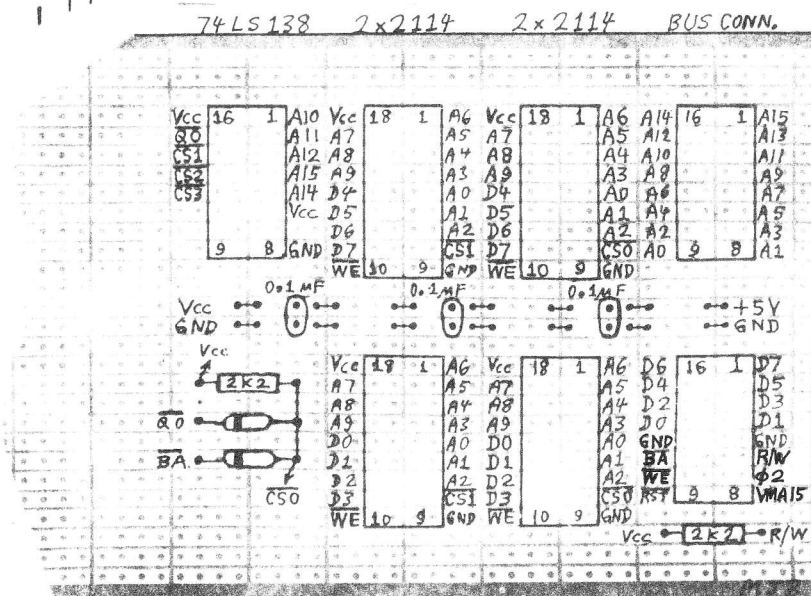


MJB



ADDITIONS TO DREAM BOARD
FOR EXPANSION; BUS SOCKETS
AND PULL-UP RESISTORS.

SUGGESTED VERD LAYOUT:
BOTTOM VIEW!
(COPPER SIDE, UNDERSIDE)
LEAVE ROOM FOR FUTURE
EXPANSION (e.g. P.I.A.).
CHECK WIRING AGAINST CIRCUIT!



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0200 BD C2 87 86 00 CE 00 90 A7 00 08 8C 00 C0 26 F8
0210 BD 05 FA 86 04 97 AC 7C 00 B5 86 18 97 AB 7F 00
0220 98 7F 00 AB BD 02 B3 BD C0 79 BD 02 CC 86 01 97
0230 AA 86 1C 97 A6 BD 02 B3 BD C0 79 BD 02 CC 86 01 97
0240 96 AB 81 08 27 04 BD 45 20 F3 BD 06 57 96 B1 84
0250 01 26 07 BD 03 CA 96 26 BD 96 E2 26 0A BD 02
0260 F5 96 9C 26 35 BD 03 9C 96 B1 84 03 26 07 BD 04
0270 8D 96 9B 26 25 BD 16 96 B1 4C 81 0C 26 01 4F 97
0280 B1 96 B2 4C 81 03 26 01 4F 97 B2 20 C0 D6 B0 86
0290 09 01 01 4A 26 FC 5A 26 F6 39 BD 05 82 BD C2 C4
02A0 7E 02 00 CE 00 88 86 FF 97 A5 A7 00 08 8C 00 90
02B0 26 F8 39 CE 00 C0 DF 90 4F C6 28 C1 10 2E 02 86
02C0 FF A7 00 8B 08 84 3F 08 5A 26 F0 39 CE 00 C0 7F
02D0 00 A1 C6 05 37 C6 08 37 DF 92 A6 00 2B 05 97 A0
02E0 BD 06 67 DE 92 08 33 5A 26 ED 96 A1 8B 05 97 A1
02F0 33 5A 26 E0 39 7F 00 9D DE 90 A6 00 97 A0 2B 23
0300 96 B3 91 B4 2D 06 8D 4D 96 9A 26 14 8D 29 BD 06
0310 67 DE 90 A6 00 9B AA 84 3F A7 00 97 A0 BD 06 67
0320 7C 00 9D DE 90 08 BC 00 E8 26 05 BD 18 CE 00 C0
0330 DF 90 96 9D 27 C2 39 96 91 44 44 84 07 16 48
0340 48 1B 97 A1 39 96 AB 4C 97 AB 81 60 26 06 7F 00
0350 AB 70 00 AA 39 7F 00 9A 8D DD C1 04 27 2D 96 91
0360 8B 08 97 93 DE 92 A6 00 81 FF 26 1E DE 90 86 FF
0370 A7 00 BD 06 67 DE 92 96 A0 A7 00 96 A1 8B 05 97
0380 A1 BD 06 67 7F 00 B3 7C 00 9A 39 7C 00 9C BD 06
0390 67 BD E8 BD 06 9A C6 64 BD C2 E1 39 86 01 B5 80
03A0 10 26 10 BD 06 57 96 A6 81 02 27 03 4A 97 A6 BD
03B0 06 57 39 86 02 B5 80 10 26 0F BD 06 57 96 A6 81
03C0 3B 2C 03 4C 97 A6 BD 06 3C 96 3F 26 22 39 86 08
03D0 BD 06 3C 7A 00 A5 BD 06 3C 96 3F 26 22 39 86 08
03E0 B5 80 10 27 09 39 BD 06 3C 96 3F 26 22 39 86 08
03F0 8B 02 97 A4 86 1B 97 A5 BD 06 3C 7C 00 B3 39 CE
0400 00 8B A6 00 91 A4 26 06 A6 01 91 A5 27 0A 08 08
0410 8C 00 90 26 ED BD 0D 39 86 FF A7 00 A7 01 BD 06
0420 B1 BD C6 39 96 A5 C6 05 BD 06 2B 16 48 48 1B 97
0430 A1 17 48 48 48 8A C0 97 93 C6 08 DE 92 A6 00 2B
0440 0B 96 A4 A0 00 2A 01 40 B1 04 2F 07 7C 00 93 5A
0450 26 E9 39 A6 00 97 A0 86 FF A7 00 BD 03 E6 C6 01
0460 BD 05 E4 BD 06 9A C6 03 BD C2 E1 BD 06 9A BD 06
0470 67 BD 05 F1 7A 00 AB 27 01 39 7C 00 98 96 B5 81
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0480 0A 26 06 7C 00 AC 7C 00 AC BD 05 82 39 7F 00 99
0490 CE 00 88 D6 AF D7 AE DF 94 A6 00 97 DE 94 7C 00 A3 96
04A0 01 97 A3 B1 1F 27 30 BD 06 4F 96 3F 27 07 BD 04 E7 96 9B 26
04B0 A3 A7 01 BD 06 4F 96 3F 27 07 BD 04 E7 96 9B 26
04C0 09 DE 94 08 08 D6 AE 5A 26 CB 39 96 99 26 F2 96
04D0 B1 26 EE 8D 58 20 EA 8D 02 20 E6 BD 06 4F DE 94
04E0 86 FF A7 00 A7 01 39 96 A4 91 A2 26 0F 96 A5 91
04F0 A3 26 09 BD E9 BD 06 81 BD 03 E9 39 96 A3 81 1C
0500 2C 01 39 8D D6 BD 06 AC BD 06 CB C6 64 D7 21 C6
0510 40 BD C2 E5 7A 00 AC 2E 04 7C 00 9B 39 BD 05 82
0520 BD C0 79 BD 02 A3 BD 02 CC BD 06 57 39 BD C1 32
0530 C6 08 37 84 07 97 97 86 20 C6 05 37 97 96 9A 97
0540 8A C0 97 93 DE 92 A6 00 2A 18 96 96 80 08 33 5A
0550 26 E9 96 97 D6 B3 C4 01 27 02 4A 4A 4C 33 5A 26
0560 D1 39 33 33 8B 02 97 A2 DE 94 A7 00 96 96 44 44
0570 44 16 48 48 1B 8B 03 97 A3 A7 01 BD 06 4F 7C 00
0580 99 39 4F CE 01 C0 BD C0 7D 43 CE 01 C8 BD C0 7D
0590 86 10 BD C6 04 37 8D 86 2C BD 06 BD 86 04 BD C3 E0 96
05A0 B5 CE 00 B6 BD C1 E0 CE 00 B7 BD 40 08 BD 3D 86
05B0 18 BD C3 E0 96 A7 CE 00 B6 BD C1 E0 4F A7 00 CE
05C0 00 B6 C6 04 37 8D 25 08 33 5A 26 FB 86 33 BD C3
05D0 E0 CE 00 AC 8D 16 86 39 97 2E CE 06 D8 C6 04 BD
05E0 C2 26 C6 C8 D7 20 7D 00 20 26 FB 39 A6 00 7E C3
05F0 D2 96 A7 81 FA 27 03 7C 00 A7 C6 28 86 FF BD 06
0600 2B 16 96 A7 BD 06 2B 8B 01 97 B4 86 04 D6 B5 C1 06
0610 A7 C6 40 BD 06 2B 8B 01 97 B4 86 04 D6 B5 C1 06
0620 2C 06 4A C1 03 2C 01 4A 97 AF 39 7F 00 AD 5D 27
0630 08 10 25 05 7C 00 AD 20 FB 96 AD 39 96 A4 97 2E
0640 96 A5 97 2F C6 01 CE 06 D7 7F 00 3F 7E C2 26 96
0650 A2 97 2E 96 A3 20 EB 96 A6 97 2E 86 1C 97 2F C6
0660 04 CE 06 D8 7E C2 26 C6 04 96 A1 97 2F 96 A0 97
0670 2E 84 01 27 06 CE 06 E0 7E C2 26 CE 06 DC 7E C2
0680 26 BD 05 C6 02 BD 05 E4 96 A4 4A 97 2E 96 A5 4A
0690 97 2F C6 03 CE 06 EA 7E C2 26 96 A0 4A 97 2E 96
06A0 A1 4A 97 2F C6 06 CE 06 E4 7E C2 26 96 A6 4A 97
06B0 2E 86 1B 97 2F C6 05 CE 06 ED 7E C2 26 97 2E 86
06C0 19 97 2F C6 07 CE 06 F2 7E C2 26 CE 01 00 63 00
06D0 08 8C 02 00 26 F8 39 80 20 70 F8 88 F8 A8 F8 50
06E0 F8 AB F8 88 7C FE FE FE 6C A0 40 A0 38 7C FE
06F0 FE FE F0 F0 F0 F0 F0 F0 F0 F0 98 91 83 73 DA D0
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