

Meccano MAX – LED array signalling

The tables below give the results of a signal sniffing exercise to read the traffic being sent to the LED array (or “face”) for the options given as part of the programming package.

The first 16 lines in each table are the data bytes sent to the array, derived from measurements of the time between transitions of the waveform. A representative sample of the results, with the derived binary and hexadecimal forms, is:

Time interval between transitions (+ = high, - - low). 1 st interval is the start bit.	Bits	Hex
-132 +564 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +276 -176 +236 -144 +280 -144 +136 -284 +280 -144 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -140 +280 -144 +280 -144 +156 -272 +284 -144 +280 -152 +260 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -144 +276 -144 +280 -144 +148 -272 +280 -144 +284 -140 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -144 +276 -144 +280 -144 +144 -276 +280 -144 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -144 +280 -140 +280 -144 +144 -288 +312 -108 +272 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -140 +284 -140 +280 -144 +160 -260 +280 -144 +280 -140 +284 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -140 +284 -140 +280 -140 +148 -276 +280 -144 +280 -140 +284 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -140 +284 -140 +280 -140 +152 -296 +260 -140 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -144 +280 -140 +280 -144 +144 -276 +280 -144 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -144 +280 -140 +280 -144 +140 -280 +280 -144 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+280 -144 +280 -144 +280 -140 +280 -152 +144 -284 +276 -132 +280 -144 +332 -124	1 1 1 1 0 1 1 1	0xF7
+256 -140 +280 -144 +280 -144 +276 -144 +140 -284 +280 -140 +280 -144 +280 -144	1 1 1 1 0 1 1 1	0xF7
+280 -140 +280 -144 +280 -144 +276 -144 +140 -284 +280 -140 +280 -144 +280 -144	1 1 1 1 0 1 1 1	0xF7
+280 -140 +280 -144 +280 -144 +280 -160 +132 -280 +272 -140 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+284 -140 +280 -144 +280 -140 +284 -140 +140 -280 +284 -140 +280 -144 +280 -140	1 1 1 1 0 1 1 1	0xF7
+284 -140 +280 -176 +240 -140 +140 -284 +140 -280 +140 -284 +280 -140 +284 -140	1 1 1 0 0 0 1 1	0xE3
+280 -144 +280 -140 +284 -140 +288 -156 +144 -268 +284 -132 +144 -276 +280 -140	1 1 1 0 1 0 1	0xF5
+280 -144 +148 -276 +144 -280 +276 -144 +280 -144 +280 -140 +280 -144 +144 -280	1 0 0 1 1 1 1 0	0x9E

The bits are sent MSB first, which is reflected in the Hex values. The first 16 rows are the actual data that appears on the display, with the top or first byte giving the left-hand edge of the array (looking at it from the front) and the first bit giving the top LED. The 17th row is the same for all displays at 0xF5, and the 18th is most likely some sort of checksum.

The blank display is the easiest to analyse, and gives a simple equation for the checksum – bitwise XOR all data bytes, then XOR the result with 0xAF. Unfortunately, this does not work for the other cases.

Text Messages

BLANK	HELP!	YO!	?	<u>LOL!</u>	HELLO	Zzz	BYE	!!	WOW	YES	OK	Thx
FF	FF	FF	FF	7F	FF	FF	FF	FF	FF	FF	FF	FF
FF	81	FF	FF	7F	81	DD	FF	FF	E3	FD	FF	FF
FF	F7	FD	FF	41	F7	CD	81	FF	DF	FB	FF	FB
FF	81	FB	FF	5F	81	D5	A5	FF	E7	87	C3	C3
FF	FF	87	FF	5F	FF	D9	A5	FF	DF	FB	BD	FB
FF	81	FB	F9	7F	81	DD	DB	FF	E3	FD	BD	FF
FF	B5	FD	FD	41	B5	FF	FF	FF	FF	FF	C3	C3
FF	FF	FF	A5	5D	FF	DB	F1	85	C3	81	FF	F7
FF	81	C3	F5	41	81	CB	8F	85	DB	B5	81	C3
FF	BF	BD	F1	7F	FF	D3	F1	FF	C3	B5	E7	FF
FF	FF	BD	FF	41	81	DB	FF	FF	FF	FF	DB	DB
FF	81	C3	FF	5F	FF	FF	81	FF	E3	BB	BD	E7
FF	F5	FF	FF	5F	81	DB	B5	FF	DF	B5	FF	E7
FF	F1	A1	FF	7F	BD	CB	B5	FF	E7	B5	FF	DB
FF	FF	FF	FF	53	81	D3	FF	FF	DF	CD	FF	FF
FF	A1	FF	FF	7F	FF	DB	FF	FF	E3	FF	FF	FF
F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5
OA	8B	E9	84	DB	14	22	01	63	C7	35	20	E2

Default – moving bar

F7	EF
F7	E3
F7	EF
C1	EF
F7	EF
F5	AF
C0	9E

Note – The check-sum is not affected by the horizontal position of the vertical bar. This would indicate that there are no shifts or rotations involved in generating the checksum.

Faces: