Optimus Popularis Protocol

When connected to a PC or Mac, Popularis will be exposed as generic Mass Storage Device (referred later as virtual Disk) that can be used to control the device and display images on the LCD buttons. Just open an appropriate .sys file and write commands or data to them.

Image dimensions, scancode map and programming examples can be found in Popularis Library SDK from
http://www.artlebedev.com/everything/optimus/popularis/ developers section

Table 1:

File name	Description	Location	Format
/vOptimus/upgrade.bin	It's a write-only file, to upgrade firmware	virtual disk	"_upgrade" + firmware data + checksum (two bytes)
/vOptimus/order.sys	To adjust the brightness of LCD	virtual disk	Write the string to file, to: Adjust brightness: "b" + ###; ### is brightness value from 000 to 100 (example: "b050") Execute scancode writing to keyboard chip: "wc"
/vOptimus/version.sys	It's a read-only file, to store the firmware version information	virtual disk	"Version x.x.x.x" , x.x.x.x is firmware version number, Ex. "Version 1.0.1.5".
/vOptimus/layout.sys	It's a write-only file, to switch LCD button display layout.	virtual disk	The format is 114-bytes data, each byte represents which layout will be displayed on the LCD, 1 0x00 : To display default layout. 2 0x01 : To display dynamic picture.
/vOptimus/normal/xxx.sys	To real-time update default LCD picture of normal operation, xxx is LCD number: 001 to 079.	virtual disk	3 bytes for one pixel, RGB format, 24 bit, 8bit to one color component. The displayed image is mirrored both vertical and horizontal during the hardware peculiarities. The image size of the particular display can be found in Appendix B. The image drawing example can be found in Library SDK.
/vOptimus/shift/xxx.sys	To real-time update default LCD picture while "shift-key pressing" or "Num-Luck" or "Caps Lock", xxx is LCD number: 001 to 079.	virtual disk	3 bytes for one pixel, RGB format, 24 bit, 8bit to one color component. The displayed image is mirrored both vertical and horizontal during the hardware peculiarities. The image size of the particular display can be found in Appendix B. The image drawing example can be found in Library SDK.

/vOptimus/dynamic/xxx.sys	To display dynamic LCD picture of normal operation, xxx is LCD number: 001 to 079.	virtual disk	3 bytes for one pixel, RGB format, 24 bit, 8bit to one color component. The displayed image is mirrored both vertical and horizontal during the hardware peculiarities. The image size of the particular display can be found in Appendix B. The image drawing example can be found in Library SDK.
/vOptimus/scancode.sys	To store the default keypad scan-code.	SD card	This file is divided into 144 segments, 64 bytes each. To change the scancodes for a specific button, just fill a corresponding segment with two-byte pairs – first byte is a command and the second is a scancode value. The rest of the segment should be terminated with 0xFF. The available commands are: **0x01** – Single press and release **0x02** – Key down **0x04** – Key up Example: Ctrl+Alt+Del - 0x02 **0x72** 0x02 **0x74** 0x02 **0x4C** 0x04 **0x74** 0x04 **0x72** 0x04 **0x4C** 0xFF... (64 bytes)

Table 2:

Key Define	Key code (HEX)	Key Define	Key code(HEX)	Key Define	Key code(HEX)	Key Define	Key code(HEX)
00H	0	key_p	13	key_9	26	key_cap	39
00H	1	key_q	14	key_0	27	key_f1	3A
01h	2	key_r	15	key_enter	28	key_f2	3B
key_undefine	3	key_s	16	key_esc	29	key_f3	3C
key_a	4	key_t	17	key_bs	2A	key_F4	3D
key_b	5	key_u	18	key_tab	2B	key_f5	3E
key_c	6	key_v	19	key_space	2C	key_F6	3F
key_d	7	key_w	1A	key_neg	2D	key_f7	40
key_e	8	key_x	1B	key_equation	2E	key_f8	41
key_f	9	key_y	1C	key_L_brackets	2F	key_f9	42
key_g	A	key_z	1D	key_R_brackets	30	key_f10	43
key_h	B	key_1	1E	key_code29 (/)	31	key_f11	44
key_i	C	key_2	1F	key_code42	32	key_f12	45
key_j	D	key_3	20	key_semicolon	33	key_print	46
key_k	E	key_4	21	key_apostrophe	34	key_scroll	47
key_l	F	key_5	22	key_tilde (~)	35	key_pause	48
key_m	10	key_6	23	key_comma	36	key_insert	49

key_n	**11**	key_7	**24**	key_dot	**37**	key_home	**4A**
key_o	**12**	key_8	**25**	key_interrogation	**38**	key_pgup	**4B**
key_del	**4C**	key_num_0	**62**	key_r_alt	**78**	key_undo	**8E**
key_end	**4D**	key_num_dot	**63**	key_r_win	**79**	key_copy	**8F**
key_pgdn	**4E**	key_code45	**64**	key_help	**7A**	key_cut	**90**
key_R_arrow	**4F**	key_app	**65**	key_mute	**7B**	key_paste	**91**
key_L_arrow	**50**	key_padequ	**66**	key_vol_down	**7C**	key_office_home	**92**
key_dn_arrow	**51**	key_f13	**67**	key_vol_up	**7D**	key_www_home	**93**
key_Up_arrow	**52**	key_f14	**68**	key_word	**7E**	key_www_back	**94**
key_num_lock	**53**	key_f15	**69**	key_excel	**7F**	key_www_forward	**95**
key_num_div	**54**	key_code107	**6A**	key_mail	**80**	key_redo	**96**
key_num_star	**55**	key_code56	**6B**	key_calender	**81**	key_reply	**97**
key_num_neg	**56**	key_code133	**6C**	key_calculator	**82**	key_forward	**98**
key_num_plus	**57**	key_code14	**6D**	key_log_off	**83**	key_send	**99**
key_num_enter	**58**	key_code132	**6E**	key_app_l	**84**	key_next_track	**9A**
key_num_1	**59**	key_code131	**6F**	key_app_r	**85**	key_pre_track	**9B**
key_num_2	**5A**	key_151_Hangul	**70**	key_task_pane	**86**	key_stop	**9C**
key_num_3	**5B**	Key_150_Hanja	**71**	key_spell	**87**	key_play	**9D**
key_num_4	**5C**	key_L_ctrl	**72**	key_files	**88**	key_media_sel	**9E**

key_num_5	**5D**	key_l_shift	**73**	key_new	**89**	key_my_computer	**9F**
key_num_6	**5E**	key_l_alt	**74**	key_open	**8A**	key_www_search	**A0**
key_num_7	**5F**	key_L_win	**75**	key_close	**8B**	key_www_stop	**A1**
key_num_8	**60**	key_r_ctrl	**76**	key_save	**8C**	key_www_refresh	**A2**
key_num_9	**61**	key_r_shift	**77**	key_f12_print	**8D**	key_www_favorites	**A3**
key_power	**A4**						
key_sleep	**A5**						
key_wake_up	**A6**						
key_fn	**A7**						

Appendix **A** : LCD display location map and scancodes (top number is display number, bottom number is a default scancode HEX number).

01	02	03	04	05	06	07	08	09	10	11	12	13	14
0x29	0x3A	0x3B	0x3C	0x3D	0x3E	0x3F	0x40	0x41	0x42	0x43	0x44	0x45	0x4C

15

16	17	18	19	20	21	22	23	24	25	26	27	28	29
0x35	0x1E	0x1F	0x20	0x21	0x22	0x23	0x24	0x25	0x26	0x27	0x2D	0x2E	0x2A

30	31	32	33	34	35	36	37	38	39	40	41	42	43
0x2B	0x14	0x1A	0x08	0x15	0x17	0x1C	0x18	0x0C	0x12	0x13	0x2F	0x30	0x31

44	45	46	47	48	49	50	51	52	53	54	55	56
0x39	0x04	0x16	0x07	0x09	0x0A	0x0B	0x0D	0x0E	0x0F	0x33	0x34	0x28

57	58	59	60	61	62	63	64	65	66	67	68
0x73	0x1D	0x1B	0x06	0x19	0x05	0x11	0x10	0x36	0x37	0x38	0x77

69	70	71	72	73	74	75
0x72	0x75	0x74	0x2C	0x78	0x76	0x52

Fn:	76	77	78
0xA7	0x50	0x51	0x4F

Appendix **B** : LCD display dimensions (in pixels). In Library SDK: `const static` SDimensions MXPopularisKeymap[]

LCD number	Width	Height	LCD number	Width	Height
1	104	72	40	72	72
2	72	72	41	72	72
3	72	72	42	72	72
4	72	72	43	72	72
5	72	72	44	134	72
6	72	72	45	72	72
7	72	72	46	72	72
8	72	72	47	72	72
9	72	72	48	72	72
10	72	72	49	72	72
11	72	72	50	72	72
12	72	72	51	72	72
13	72	72	52	72	72
14	72	72	53	72	72
15	1364	102	54	72	72
16	72	72	55	72	72
17	72	72	56	134	72
18	72	72	57	184	72
19	72	72	58	72	72
20	72	72	59	72	72
21	72	72	60	72	72
22	72	72	61	72	72
23	72	72	62	72	72
24	72	72	63	72	72
25	72	72	64	72	72
26	72	72	65	72	72
27	72	72	66	72	72
28	72	72	67	72	72
29	104	72	68	184	72
30	104	72	69	104	72

31	72	72	70	104	72
32	72	72	71	104	72
33	72	72	72	388	72
34	72	72	73	72	72
35	72	72	74	72	72
36	72	72	75	72	72
37	72	72	76	72	72
38	72	72	77	72	72
39	72	72	78	72	72

Appendix **C** : Scancode offsets in file Scancode.sys (in bytes)

Key	Offset
01	0x300
02	0x440
03	0x640
04	0x780
05	0x700
06	0x000
07	0xD00
08	0xF80
09	0xE40
10	0x1440
11	0x1400
12	0x1500
13	0x1480
14	0x1640
15	
16	0x240
17	0x200
18	0x400
19	0x600
20	0x800
21	0x840
22	0xA40
23	0xA00
24	0xC00
25	0xE00
26	0x1000
27	0x1040
28	0xC40
29	0x1580
30	0x380
31	0x3C0
32	0x5C0
33	0x7C0
34	0x9C0
35	0x980
36	0xB80
37	0xBC0
38	0xDC0
39	0xFC0
40	0x11C0
41	0x1180
42	0xD80
43	0x1540
44	0x580
45	0x340
46	0x540
47	0x740
48	0x940
49	0x900
50	0xB00
51	0xB40
52	0xD40
53	0xF40
54	0x1140
55	0x1100
56	0x14C0
57	0x1F80
58	0x2C0
59	0x4C0
60	0x6C0
61	0x8C0
62	0x880
63	0xA80
64	0xAC0
65	0xCC0
66	0xEC0
67	0x1080
68	0x1F40
69	0x040
70	0x2180
71	0x1300
72	0x1700
73	0x1280
74	0x0C0
75	0x1D00
Fn:	0x1380
76	0x1C80
77	0x1680
78	0x1880