C1068
JPEG Module w/UART Interface

User Manual v1.1

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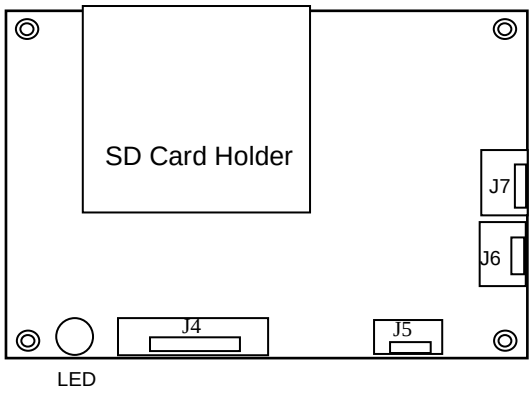
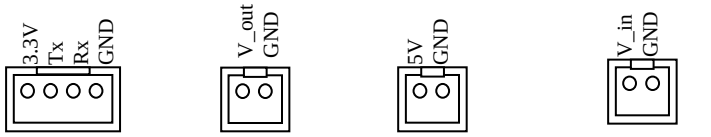
Hardware

1. Understanding the connectors

J3- SD card holder.
J4- UART port: 4 pin connector, 3.3VDC, Tx, Rx, GND.
J5- Video output: 2 pin connector, connect to TV video input.
J6- DC input: 2 pin connector, DC input 5V.
J7- Video input: 2 pin connector, video signal input.



1.1 Pin description of the connectors



2. Module Specification

Storage	External SD card up to 16GB
Display Connector	Composite video out
Video Capture	D1 and QVGA
Photo Resolution	D1, VGA, QVGA JPEG format
UART Baud Rate	115200 bps
Video Input	Composite video 1V p-p
Board size	50 x 60 mm

Software

3. Send Commands to the Module

First of all, one needs to setup the communication between the host machine to the module. Please follow the format described below to send the commands. Otherwise, the module does not response correctly.

3.1 Definition of Commands

The commands are string of the hexadecimal number, it consists **synchronization byte** and **check bit**. There are 2 types of commands: **ID Command**, and **ACK Command**.
Synchronization byte (0xaa) is placed at the front of command, used for the synchronization between the host machine and the Module.
Checksum Byte is equal to the lowest 8 bit of the summation of all the other bytes in the command. It is used for the verification of the command.

3.1.1 ID Command

This is a variable length command containing the sync byte, length of the command, command ID and Checksum. The format of ID command is shown in the following.

Format	Sync Byte (8 bits)	Length of the command (8 bits)	Command ID in HEX (8 bits)	Parameter N (8 bits x N)	Checksum (8 bits)
example(Set PAL)	0xaa	0x03	0x03	0x01	0xb1

Explanation:
Sync Byte: 0xaa, as described before
Length of the command: this is to tell the module how many bytes to be followed. In the example, there are 3 bytes following the 2nd byte, so, we tell the module there are 3 bytes to be followed in this command, we assign 0x03 for this byte
Command ID: refer to the command list in this document. In the example, the command ID 0x12 is for NTSC/PAL selection.
Parameter: each command may follow different numbers of parameters, may be 0 or many. In this case, one parameter: select PAL. If there are more parameters, the 2nd byte, length of command will be different.
Checksum: The sum of the command is aa+03+03+01=b1, so Checksum is 0xb1.

3.1.2 ACK Command

ACK Command is a variable length command containing the acknowledgement and the results returned for the ID command. Similar to ID command, it contains also the length of the results and check bit for verification. The format of ACK Command is shown in the following.

Format	Sync Byte (8 bits)	Length of the result(8 bits)	Return (variable)	Checksum (8 bits)
example (Request the system clock)	0xaa	0x08	0x14 0x0a 0x04 0x0c 0x0b 0x36 0x00 (2010-04-12 11:54:00)	0x21

If the ID command is received correctly and proceed to action, the module will send 0xaa 30 to acknowledge host. Means the module has received the command, tell host to wait for further ACK command.
There are 3 types of fail message return from the module:
1. If the checksum of the ID command is not received correctly, the module will acknowledge the fail message 0xaa 02 01 ad. Such case, no 0xaa 30 will be sent before the acknowledgement.
2. If the ID command is received correctly but the module cannot execute correctly, it will send 0xaa 30 before the error code 0xaa 02 01 ad
3. If the command is correct but not valid for the operation, it will return mode error 0xaa 50 to acknowledge host. For instance, at playback mode you ask it to do a snap shot, it will return mode error.
4. The worst case, if there is not the correct command format or command not existed, it will **not** ack anything.

Note: some commands need to take time for execution, so, need to make sure it is available before sending the other command. Otherwise, it will encounter the machine hang problem. If motion detect ON, one have better to turn it OFF before sending other command. Otherwise, it will be always activated and not response to other command.

4. Get Data from the Module

Before getting image data from the module, one needs to get the relative file information: the total files and which file want to down load. Then set the desired file to current, get the file information such as file name, size. After that, one can set the packet size and calculate the no of packet to get the data accordingly.

Below is the flow of the operation. Note this operation is valid at playback mode only.

Host	**Module**
Get current file information ➔`0xaa 02 31 dd`	←`0xaa 30 aa 12 p1…p17 checksum` (p1..p13=file name in ASCII, p14..17=file size)
Set Packet size ➔`0xaa 04 35 p1 p2 checksum`	←`0xaa 30 aa 02 00 ac` (ack)
Download 1st packet ➔`0xaa 04 36 00 00 e4`	←`0xaa 30 aa 00 00 d0…..dn checksum aa` (d0..dn=data, aa after checksum is sync bit)
	←`0xaa 30 aa 00 01 d0…dn checksum aa`
Download 2nd packet ➔`0xaa 04 36 00 01 e5`	←`0xaa 30 aa nn nn d0..dn checksum aa`
Download nth packet ➔`0xaa 04 36 nn nn checksum`	

Detail explanation of commands and return from module can be referred to the command list in the following pages

5. Summary of Commands

System Configurations		
ID in Dec	**ID in Hex**	**Function**
00	00	Get module status
01	01	Set the system clock
02	02	Request the system time
03	03	Select the TV Standard – NTSC/PAL
04	04	Format the storage media
05	05	Motion Detect set – on or off
06	06	MD sensitivity set – High/Middle/Low
07	07	Select Photo or AVI
10	0a	Get Version
67	43	Set Time stamp ON/OFF
Operations		
16	10	Set operation mode – preview or playback
17	11	Request current mode
19	13	Manual capture – JPG
20	14	Manual capture – AVI
21	15	Manual capture – Stop
JPG Capture		
32	20	Set the compression ratio
33	21	Set Intervals between MD – 1-99 sec
34	22	Set number of shot per trigger – 1-3
65	41	Set photo resolution
AVI Capture		
37	25	Set the display size
38	26	Set the duration of AVI capture – 1-99sec
39	27	Set frame rate : 1-30fps
File Management		
48	30	Get current file information
49	31	Get current file content
50	32	Select a particular file
51	33	Select the Previous / Next file
52	34	Playback the current AVI
53	35	Set packet size
54	36	Download current file from the Module
55	37	Delete file –current or ALL

6. List of Commands

1 0x00 Get status of the module

ID	0x00
Description	Get status of the module
ID Command	0xaa 02 00 ac
Operation Mode	Preview/playback mode
Parameter	N/A
Return from the Module	0xaa 16 p1 p2 p3 p4 p5 p6 p7 p8, p9, p10,p11,p12,p13,p14,p15,p16,p17,p18,p19,p20,p21 checksum P1: Motion detect on (1), off(0) P2: MD sensitivity Hi(2), Mid(1), Low(0) P3: AVI (1) or photo (0) P4: Preview (0) or Playback (1) P5: reserved P6: Jpeg Ratio Hi(2), Mid(1),Low(0) P7: Interval P8: Capture Num P9: AVI display size QVGA(0), D1(1) P10: AVI Frame Rate P11: Duration P12: Set TV standard NTSC(0), PAL(1) P13: photo resolution P14: RSV P15: SYS time show on/off P16...P21 reserved 0xaa 01: Failed

Example：Get status of the module

Host:
```
AA 02 00 AC
```
Wait for reply

Module:
```
AA 30 AA 16 00 02 00 00 00 01 01 03 01 0D 3C 00 01 00 00
04 00 00 00 00 00 16
```

2 0x01 Set the system clock

ID	0x01
Description	Set the system clock
ID Command	0xaa 09 01 P1 P2 P3 P4 P5 P6 P7 Checksum
Operation Mode	Preview mode
Parameter	P1: Y3Y2: Year (0x14) P2: Y1Y0: Year (in hex) P3: M1M0: Month (in hex) P4: D1D0: Day (in hex) P5: H1H0: Hour (in hex) P6: Mi1Mi0: Minutes (in hex) P7: S1S0: Second (in hex)
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error

Example：Set the system clock to 2010/03/01 12:59:59

Host:
```
AA 09 01 14 0A 03 01 0C 3B 3B 58
```
Wait for reply

Module:
```
AA 30 AA 02 00 AC  ;OK
```

3 0x02 Request the system time

ID	0x02
Description	Request the system time
ID Command	0xaa 02 02 ae
Parameter	N/A
Operation Mode	Preview mode
Return from Module	0xaa 08 P1 P2 P3 P4 P5 P6 P7 Checksum P1: Y3Y2: Year (0x14) P2: Y1Y0: Year (in hex) P3: M1M0: Month (in hex) P4: D1D0: Day (in hex) P5: H1H0: Hour (in hex) P6: Mi1Mi0: Minutes (in hex) P7: S1S0: Second (in hex) 0xaa 01 : Failed

Example：Request the system time
Host:
AA 02 02 AE
Wait for Response
	Module:
	AA 30 AA 08 14 0A 03 01 10 35 09 22
	# Length of the command = 8 bytes;
	Return = 0x140A (Year: 2010), 0x03 (Month: 03),
	0x01 (Day: 01), 0x10 (Hour: 16),
	0x35(Minute: 53); 0x09 (Second: 09)
	(2010/03/1 16:53:09);
	Checksum= 0x22

4. 0x03 Select the TV Standard

ID	0x03
Description	Select the TV Standard Parameter: NTSC / PAL
ID Command	0xaa 03 03 p1 Checksum
Parameter	P1:0x00: NTSC 0x01: PAL (Default)
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error
Example：Select NTSC as the TV standard Host: AA 03 03 00 B0 Wait for OK	Module: AA 30 AA 02 00 AC ;OK

5. 0x04 Format the storage media

ID	0x04
Description	Format the storage media
ID Command	0xaa 02 04 b0
Parameter	N/A
Operation Mode	Playback mode
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error 0x03: External memory card write-protect
Example：Format the external memory Host: AA 02 04 B0 Wait for OK	Module: AA 30 AA 02 00 AC ;OK

6 0x05 Motion Detect Set

ID	0x05
Description	Enable or disable Motion detect
ID Command	0xaa 03 05 p1 checksum
Parameter	P1: 0x00 –off, 0x01 - on
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error
Example：Enable the motion detect Host: AA 03 05 01 B3 Wait for OK Module: AA 30 AA 02 00 AC ;OK	

7 0x06 Motion Sensitivity Set

ID	0x06
Description	Set sensitivity for Motion detect
ID Command	0xaa 03 06 p1 checksum
Parameter	P1: 0x00 - low 0x01 – medium 0x02 – high
Operation Mode	Preview mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error
Example：Set sensitivity to High Host: AA 03 06 02 B5 Wait for OK Module: AA 30 AA 02 00 AC ;OK	

8 0x07 Select Photo or AVI

ID	0x07
Description	Select Photo or AVI in preview mode
ID Command	0xaa 03 07 p1 checksum
Parameter	P1: 0x00 –photo 0x01 - AVI
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed 0x02: No SD card 0x50: Mode error
Example：select AVI Host: AA 03 07 01 B5 Wait for OK Module: AA 30 AA 02 00 AC ;OK	

9 0x0a Get Version

ID	0x0a
Description	Get the firmware version of the module
ID Command	0xaa 02 0a b6
Parameter	N/A
Operation Mode	Preview & playback mode
Return from Module	0xaa 0a p1… p9 checksum(p1…p9 is the version of the module in ASCII)

Example：Get the version

Host:
AA 02 0A B6
Wait for Response

Camera:
AA 30
AA 0A 36 38 31 30 20 76 31 30 31 F7
Command Length : 0a
36 38 31 30 20 76 31 30 31 - version of the module
f7 checksum

10. 0x10 Select the operation mode

ID	0x10
Description	Select the operation mode, preview or playback Note: all system configuration and capture function is operated within preview mode. File management is operated under playback mode. If operate under wrong working mode, it will feed back by mode error.
ID Command	0xaa 03 10 p1 checksum
Parameter	P1: 0x10 – preview 0x11 – playback
Operation Mode	Preview/playback mode
Return from Module	0x00: OK 0x01: Failed 0x02: No SD card or no file

Example：Select Playback as the operation mode

Host:
AA 03 10 11 CE
Wait for OK

Module:
AA 30 AA 02 00 AC ;OK

11. 0x11 Request the current operation mode

ID	0x11
Description	Request the current operation mode
ID Command	0xaa 02 11 bd
Parameter	N/A
Operation Mode	Preview/playback mode
Return from Module	0x10 : preview mode 0x11: playback Mode Follow the status 0x00: OK 0x01: Failed

Example：Request the current operation mode

Host:
AA 02 11 BD
Wait for Response

Module:
AA 30 AA 02 10 BC
AA 02 00 AC ;OK

12 0x13 Manual Capture Photo

ID	0x13
Description	Capture a JPG
ID Command	0xaa 02 13 checksum
Parameter	N/A
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed; 0x02: No SD card; 0x03: Write Protect; 0x04: Not enough space; 0x50: Mode error
Example：Capture a JPG Host: AA 02 13 BF Wait for Response	Module: AA 30 AA 02 00 AC ;OK

13 0x14 Manual Capture AVI

ID	0x14
Description	Capture AVI
ID Command	0xaa 02 14 checksum
Parameter	N/A
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed; 0x02: No SD card; 0x03: Write Protect; 0x04: Not enough space; 0xF5: disk full;0xF6:auto stop recording; 0x50: Mode error;
Example：Start recording avi Host: AA 02 14 C0 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

14 0x15 Manual Stop Capture

ID	0x15
Description	Stop recording AVI
ID Command	0xaa 02 15 checksum
Parameter	N/A
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error
Example：stop recording avi Host: AA 02 15 C1 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

15 0x20 Set compression ratio for JPG

ID	0x20
Description	Set compression ratio for photos
ID Command	0xaa 03 20 p1 checksum
Parameter	P1: 0x00 (compression ratio Low) 0x01(compression ratio Medium) 0x02(compression ratio High) **Note: compression ratio low means better image quality and bigger file size.**
Operation Mode	Preview mode
Return from Module	0x00 : OK 0x01: failed 0x50: Mode error
Example：Set compression ratio to middle Host: AA 03 20 01 CE Wait for Response	Module: AA 30 AA 02 00 AC ;OK

16 0x21 Set interval between MD

ID	0x21
Description	Set interval between triggers by motion detected when MD enabled. It means during this period, the trigger is ignored.
ID Command	0xaa 03 21 p1 checksum
Parameter	P1: 1-99sec
Operation Mode	Preview mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error /
Example：Set interval to 5 sec Host: AA 03 21 05 D3 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

17 0x22 Set number of shots per trigger

ID	0x22
Description	Set number of snap shots per trigger when motion is detected. It can do multi shots when it is activated by MD.
ID Command	0xaa 03 22 p1 checksum
Parameter	P1: = 1-3 (default is 1)
Operation Mode	Preview mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error /
Example：Set 3 shots per trigger Host: AA 03 22 03 D2 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

18 0x25 Set Display size for AVI

ID	0x25
Description	Set Display size video clip
ID Command	0xaa 03 25 p1 checksum
Parameter	P1: 0x00 –QVGA 0x01 – D1
Operation Mode	Preview mode
Return from Module	0x00 : ok/ 0x01: failed 0x50: Mode error
Example：Set AVI resolution to QVGA Host: AA 03 25 00 D2 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

19 0x26 Set Duration of recording AVI

ID	0x26
Description	Set duration of video clip per trigger.
ID Command	0xaa 03 26 p1 checksum
Parameter	P1: = 1-99sec
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error
Example：Set duration to 15 sec Host: AA 03 26 0F E2 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

20 0x27 Set frame rate of AVI

ID	0x27
Description	Set frame rate of video clip
ID Command	0xaa 03 27 p1 checksum
Parameter	P1: = 1-30 (default is 30)
Operation Mode	Preview mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error /
Example：Set frame rate to 15fps Host: AA 03 27 0F E3 Wait for Response	Module: AA 30 AA 02 00 AC ;OK

21 0x30 Request System File information

ID	0x30
Description	Get system file information, which includes total no of files and number of current file
ID Command	0xaa 02 30 checksum
Parameter Command	N/A
Operation Mode	Playback mode
Return from Module	0xaa 30 aa 05 p1 p2 p3 p4 checksum aa 02 p5 checksum p1p2:total file p3p4:current file p5:0x00-OK ,0x01-Failed
Example：in the playback mode get current files in memory Host: AA 02 30 DC Wait for Response Module: AA 30 AA 05 00 07 00 02 B8 AA 02 00 AC (total file is 7, current fie is 2) AA 02 00 AC ; OK	

22 0x31 Get Current File information

ID	0x31
Description	Get current file information, which includes file's name and file size in of particular file. Note: this command MUST send before Download current file.
ID Command	0xaa 02 31 dd
Parameter Command	N/A
Operation Mode	Playback mode
Return from Module	0xaa 30 aa 11 P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13 P14 P15 P16 checksum P1: always zero (P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P12):file name in ASCII; (P13 P14 P15 P16):file size
Example：Get current file information Host: AA 02 31 DD Wait for Response Module: AA 30 AA 11 00 49 4D 47 30 30 30 31 2E 4A 50 47 00 00 6A E2 B4 (file name="IMG0001.JPG" file size=27362 bytes)	

23 0x32 Select a particular file

ID	0x32
Description	Select a particular file as current file
ID Command	0xaa 04 32 p1 p2 checksum
Parameter	P1: higher byte of file no P2: lower byte of file no Note : max no of file is 9999 if SD card is existed
Operation Mode	Playback mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error /
Example：Select the file of that the ID is 01 (1st file) Host: AA 04 32 00 01 E1 Wait for OK Module: AA 30 AA 02 00 AC ;OK	

24 0x33 Select the Previous / Next file

ID	0x33
Description	Select the Previous / Next file
ID Command	0xaa 03 33 p1 checksum
Parameter	P1: 0x00: Previous, 0x01: Next
Operation Mode	Playback mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error /
Example：Select the next file Host: AA 03 33 01 E1 Wait for OK	Module: AA 30 AA 02 00 AC ;OK

25 0x34 Playback the current AVI

ID	0x34
Description	Playback the current AVI, if current file is AVI
ID Command	0xaa 05 34 p1 p2 p3 checksum
Parameter	P1: 0x01:play(normal way with default speed) 0x02:pause 0x03:stop P2: 0x00: reserved P3: 0x00: reserved
Operation Mode	Playback mode and the current file is AVI
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error /
Example 1：**normal play forward** Host: AA 05 34 01 00 00 E4 Wait for OK	Module: AA 30 AA 02 00 AC ;OK 0xaa 0x02 0xf5 checksum ;Play End
Example 2：**pause** Host: AA 05 34 02 00 00 E5 Wait for OK	Module: AA 30 AA 02 00 AC ;OK
Example 3：**stop** Host: AA 05 34 03 00 00 E6 Wait for OK	Module: AA 30 AA 02 00 AC ;OK

26 0x35 Set the packet size

ID	0x35
Description	Set the packet size before Download current file. It can be any size, but note the connection should be affordable, if the size is too big.
ID Command	0xaa 04 35 p1 p2 checksum
Parameter	p1p2: packet size
Operation Mode	Playback mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error
Example：Set packet size :1024 Host: AA 04 35 04 00 E7 Wait for OK	AA 30 AA 02 00 AC ;OK

27 0x36 Download Current File

ID	0x36
Description	Download current file.
ID Command	0xaa 04 36 p1 p2 checksum
Parameter	p1p2: package number
Operation Mode	Playback mode
Return from Module	0xaa p1 p2 d0…dn checksum, 0xaa p1 p2 packet number, d0…dn is image data. Note there is the sync byte 0xaa following the checksum, to indicate the end of data return. Also note that d0...dn is one packet data, equal to the packet size set in 0x35 0x01: Failed / 0x50: Mode error /
Example：Download first packet of current file Download package 1 Host: AA 04 36 00 00 E4 Wait for OK	Module: AA 30 AA 00 00 FF D8……..20 43 4F 2E AA (note last aa is the sync byte)

28 0x37 Delete file

ID	0x37
Description	Delete file(s)
ID Command	0xaa 03 37 p1 checksum
Parameter	P1: 0x00 current file 0x01 all files
Operation Mode	Playback mode
Return from Module	0x00: OK / 0x01: Failed / 0x50: Mode error
Example：Delete all files Host: AA 03 37 01 E5 Wait for OK	Module: AA 30 AA 02 00 AC; OK

29 0x41 Set Photo Resolution

ID	0x41
Description	Set photo resolution
ID Command	0xaa 03 41 P1 Checksum
Operation Mode	Preview mode
Parameter	P1: 0x00—QVGA (320*240) 0x01—VGA (640*480) 0x02—D1 (NTSC/PAL)
Return from Module	0x00: OK 0x01: Failed
Example：Set resolution to VGA HOST: AA 03 41 01 EF Wait for OK	Module: AA 30 AA 02 00 AC; OK

30 0x43 Set Time stamp ON/OFF

ID	0x43
Description	Time stamp On/Off
ID Command	0xaa 03 43 P1 Checksum
Operation Mode	Preview mode
Parameter	P1: 0x00—Time stamp ON 0x01—Time stamp OFF
Return from Module	0x00: OK 0x01: Failed
Example：Set to VGA size HOST: `AA 03 43 00 F0` Wait for OK	Module: `AA 30 AA 02 00 AC;  OK`

Appendix: ASCII code table

Dec	Hex	Character	074	04A	J	117	075	u
032	020	SP	075	04B	K	118	076	v
033	021	!	076	04C	L	119	077	w
034	022	"	077	04D	M	120	078	x
035	023	#	078	04E	N	121	079	y
036	024	$	079	04F	O	122	07A	z
037	025	%	080	050	P			
038	026	&	081	051	Q			
039	027	'	082	052	R			
040	028	(	083	053	S			
041	029	)	084	054	T			
042	02A	*	085	055	U			
043	02B	+	086	056	V			
044	02C	,	087	057	W			
045	02D	-	088	058	X			
046	02E	.	089	059	Y			
047	02F	/	090	05A	Z			
048	030	0	091	05B	[			
049	031	1	092	05C	\			
050	032	2	093	05D	]			
051	033	3	094	05E	^			
052	034	4	095	05F	_			
053	035	5	096	060	`			
054	036	6	097	061	a			
055	037	7	098	062	b			
056	038	8	099	063	c			
057	039	9	100	064	d			
058	03A	:	101	065	e			
059	03B	;	102	066	f			
060	03C	<	103	067	g			
061	03D	=	104	068	h			
062	03E	>	105	069	i			
063	03F	?	106	06A	j			
064	040	@	107	06B	k			
065	041	A	108	06C	l			
066	042	B	109	06D	m			
067	043	C	110	06E	n			
068	044	D	111	06F	o			
069	045	E	112	070	p			
070	046	F	113	071	q			
071	047	G	114	072	r			
072	048	H	115	073	s			
073	049	I	116	074	t			

Document Change Log

1 First released on Aug 25th,2010
2 FW update to v1.1 on Dec 30,2010
  2.1 Add different JPG resolution selection
  2.2 Turn time stamp on/off
  2.3 Add JPG compression rate option