C1068
JPEG Module w/UART Interface

User Manual

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Table Of Content

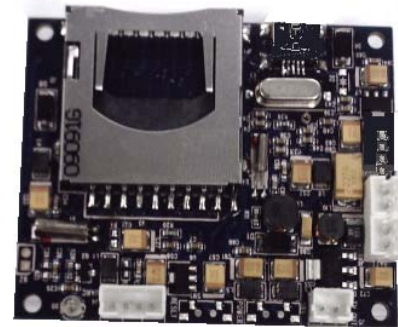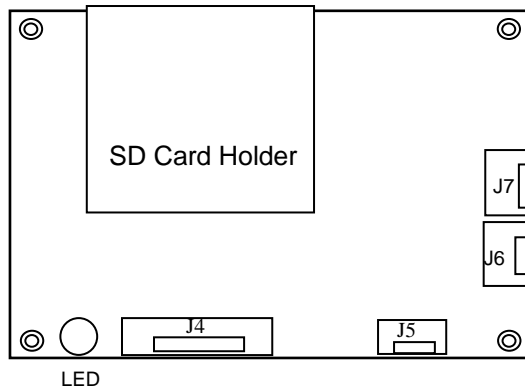## Hardware

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
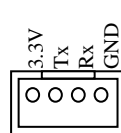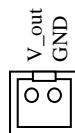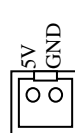
J4 - UART   **J5 - Video Out**   **J6 - DC input**   **J7 - Video in**

2. Module Specification

Storage	External SD card up to 16GB
Display Connector	Composite video out
Video Capture	720 x 576 (up to 30fps)
Photo Resolution	720 x 576 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 30 aa 12 p1…p17 checksum`
→ `0xaa 02 31 dd`   (p1..p13=file name in ASCII, p14..17=file size)

Set Packet size   ← `0xaa 30 aa 02 00 ac` (ack)
→ `0xaa 04 35 p1 p2 checksum`

   ← `0xaa 30 aa 00 00 d0…..dn checksum aa`

Download 1ˢᵗ packet   (d0..dn=data, aa after checksum is sync bit)
→ `0xaa 04 36 00 00 e4`

   ← `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
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
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 0d p1 p2 p3 p4 p5 p6 p7 p8, p9, p11, p12 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: reserve P6: Jpeg Ratio Hi(1), Low(0) P7: Interval P8: Capture Num P9: AVI display size QVGA(0), D1(1) P10: Frame Rate P11: Duration P12: Set TV standard NTSC(0), PAL(1) 0xaa 01: Failed

Example：Get status of the module
Host: Module:
AA 02 00 AC   AA 30 AA 0D 00 02 01 01 00 00 02 04 00 1E 0A 00 E9
Wait for reply

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: Module:
AA 09 01 14 0A 03 01 0C 3B 3B 58   AA 30 AA 02 00 AC ;OK
Wait for reply

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: Module:
AA 02 02 AE   AA 30 AA 08 14 0A 03 01 10 35 09 22
Wait for Response # 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: Module: AA 03 03 00 B0 AA 30 AA 02 00 AC ;OK Wait for 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: Module: AA 02 04 B0 AA 30 AA 02 00 AC ;OK Wait for 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: Module: AA 03 05 01 B3 AA 30 AA 02 00 AC ;OK Wait for 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: Module: AA 03 06 02 B5 AA 30 AA 02 00 AC ;OK Wait for 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 0x50: Mode error
Example：select AVI	
Host: Module: AA 03 07 01 B5 AA 30 AA 02 00 AC ;OK Wait for 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: Camera:
AA 02 0A B6   AA 30
Wait for Response   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
Example：Select Playback as the operation mode Host: Module: AA 03 10 11 CE AA 30 AA 02 00 AC ;OK Wait for 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: Module: AA 02 11 BD AA 30 AA 02 10 BC Wait for Response AA 02 00 AC ;OK	

12   0x13 Manual Capture Photo

ID	0x13
Description	Snap shot a JPG as per setting
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：Perform a snap shot	

Host: Module:
AA 02 13 BF   AA 30 AA 02 00 AC ;OK
Wait for Response

13   0x14 Manual Capture AVI

ID	0x14
Description	Capture AVI as per setting
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; 0x50: Mode error 0xF5: disk full; 0xF6: auto stop recording;
Example：Perform a snap shot	

Host: Module:
AA 02 14 C0   AA 30 AA 02 00 AC ;OK
Wait for Response

14   0x15 Manual Stop Capture

ID	0x15
Description	Stop Snap AVI as per setting
ID Command	0xaa 02 15 checksum
Parameter	N/A
Operation Mode	Preview mode
Return from Module	0x00: OK 0x01: Failed 0x50: Mode error
Example：Perform a snap shot	

Host: Module:
AA 02 15 C1   AA 30 AA 02 00 AC ;OK
Wait for Response

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 – low 0x01 – 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 High

Host:	Module:
AA 03 20 01 CE	AA 30 AA 02 00 AC ;OK
Wait for Response	

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:	Module:
AA 03 21 05 D3	AA 30 AA 02 00 AC ;OK
Wait for Response	

17   0x22 Set number of shots per trigger

ID	0x22
Description	Set number of snap shots per trigger when motion detection. 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:	Module:
AA 03 22 03 D2	AA 30 AA 02 00 AC ;OK
Wait for Response	

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 display size 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 p5:0-OK ,1-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 files in memory

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: Module: AA 03 33 01 E1 AA 30 AA 02 00 AC ;OK Wait for 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: 01:play(normal way with default speed)
	        02:pause
	        03:stop
	P2: 00: reserved
	P3: 00: 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: Module: AA 05 34 01 00 00 E4 AA 30 AA 02 00 AC ;OK Wait for OK 0xaa 0x02 0xf5 checksum ;Play End	
Example 2：**pause** Host: Module: AA 05 34 02 00 00 E5 AA 30 AA 02 00 AC ;OK Wait for OK	
Example 3：**stop** Host: Module: AA 05 34 03 00 00 E6 AA 30 AA 02 00 AC ;OK Wait for 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 30 AA 02 00 AC ;OK AA 04 35 04 00 E7 Wait for 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:	Module:
AA 04 36 00 00 E4	AA 30 AA 00 00 FF D8.........20 43 4F 2E AA
Wait for OK	(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:	Module:
AA 03 37 01 E5	AA 02 00 AC ; OK
Wait for OK	

Appendix: ASCII code table

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

Document Change Log

1.First released on Aug 25th,2010