

# ARECA FIRMWARE SPEC

## Usage of IOP331 adapter

(All In/Out is in IOP331's view)

### 1. Message 0

- InitThread message and return code

### 2. Doorbell is used for RS-232 emulation

inDoorBell

- bit0 data in ready zDRIVER DATA WRITE OK)
- bit1 data out has been read (DRIVER DATA READ OK)

outDoorBell:

- bit0 data out ready (IOP331 DATA WRITE OK)
- bit1 data in has been read (IOP331 DATA READ OK)

### 3. Index Memory Usage

offset 0xf00	for RS232 out (request buffer)
offset 0xe00	for RS232 in (scratch buffer)
offset 0xa00	for inbound message code message_rwbuffer (driver send to IOP331)
offset 0xa00	for outbound message code message_rwbuffer (IOP331 send to driver)

### 4. RS-232 emulation

Currently 128 byte buffer is used:

1st uint32_t	Data length (1--124)
Byte 4--127	Max 124 bytes of data

### 5. PostQ

All SCSI Command must be sent through postQ:

(inbound queue port)

Request frame must be 32 bytes aligned:

- #bit27--bit31 flag for post ccb
- #bit0--bit26 real address (bit27--bit31) of post arcmsr\_cdb

bit31	0	256 bytes frame
	1	512 bytes frame
bit30	0	normal request
	1	BIOS request
bit29	reserved	
bit28	reserved	
bit27	reserved	

(outbound queue port)

Request reply:

- #bit27--bit31

flag for reply

#bit0--bit26

real address (bit27--bit31) of reply arcmsr\_cdb

bit31	must be 0 (for this type of reply)	
bit30	reserved for BIOS handshake	
bit29	reserved	
bit28	0	no error, ignore AdapStatus/DevStatus/SenseData
	1	Error, error code in AdapStatus/DevStatus/SenseData
bit27	reserved	

## 6. BIOS request

All BIOS request is the same with request from PostQ

Except:

Request frame is sent from configuration space:

offset: 0x78	Request Frame (bit30 == 1)
offset: 0x18	writeonly to generate IRQ to IOP331

Completion of request:

(bit30 == 0, bit28==err flag)

## 7. Definition of SGL entry (structure)

## 8. Message1 Out - Diag Status Code (????)

## 9. Message0 message code

0x00	NOP	
0x01	Get Config ->offset 0xa00 :for outbound message code message_rwbuffer (IOP331 send to driver)	
	Signature	0x87974060(4)
	Request len	0x00000200(4)
	numbers of queue	0x00000100(4)
	SDRAM Size	0x00000100(4)-->256 MB
	IDE Channels	0x00000008(4)
	vendor	40 bytes char
	model	8 bytes char
	FirmVer	16 bytes char
	Device Map	16 bytes char
	FirmwareVersion	DWORD • Added for checking of new firmware capability
0x02	Set Config ->offset 0xa00 :for inbound message code message_rwbuffer (driver send to IOP331)	
	Signature	0x87974063(4)
	UPPER32 of Request Frame	(4)-->Driver Only
0x03	Reset (Abort all queued Command)	
0x04	Stop Background Activity	
0x05	Flush Cache	
0x06	Start Background Activity (re-start if background is halted)	
0x07	Check If Host Command Pending (Novell May Need This Function)	

0x08	Set controller time ->offset 0xa00 for inbound message code message_rwbuffer (driver to IOP331)	
	byte 0	0xaa <-- signature
	byte 1	0x55 <-- signature
	byte 2	year (04)
	byte 3	month (1..12)
	byte 4	date (1..31)
	byte 5	hour (0..23)
	byte 6	minute (0..59)
	byte 7	second (0..59)

## RS-232 Interface for Areca Raid Controller

The low level command interface is exclusive with VT100 terminal

### 1. Sequence of command execution

- A. Header  
3 bytes sequence (0x5E, 0x01, 0x61)
- B. Command block  
variable length of data including length, command code, data and checksum byte
- C. Return data  
variable length of data

### 2. Command block

- A. 1st byte  
command block length (low byte)
- B. 2nd byte  
command block length (high byte)

#### Note

command block length shouldn't > 2040 bytes, length excludes these two bytes

- C. 3rd byte  
command code
- D. 4th and following bytes  
variable length data bytes  
depends on command code
- E. last byte checksum byte (sum of 1st byte until last data byte)

### 3. Command code and associated data

The following are command code defined in raid controller Command code 0x10--0x1? are used for system level management, no password checking is needed and should be implemented in separate well controlled utility and not for end user access. Command code 0x20--0x?? always check the password, password must be entered to enable these command:

```
enum
{
    GUI_SET_SERIAL=0x10,
    GUI_SET_VENDOR,
    GUI_SET_MODEL,
    GUI_IDENTIFY,
    GUI_CHECK_PASSWORD,
```

```

GUI_LOGOUT,
GUI_HTTP,
GUI_SET_ETHERNET_ADDR,
GUI_SET_LOGO,
GUI_POLL_EVENT,
GUI_GET_EVENT,
GUI_GET_HW_MONITOR,
// GUI_QUICK_CREATE=0x20, (function removed)
GUI_GET_INFO_R=0x20,
GUI_GET_INFO_V,
GUI_GET_INFO_P,
GUI_GET_INFO_S,
GUI_CLEAR_EVENT,
GUI_MUTE_BEEPER=0x30,
GUI_BEEPER_SETTING,
GUI_SET_PASSWORD,
GUI_HOST_INTERFACE_MODE,
GUI_REBUILD_PRIORITY,
GUI_MAX_ATA_MODE,
GUI_RESET_CONTROLLER,
GUI_COM_PORT_SETTING,
GUI_NO_OPERATION,
GUI_DHCP_IP,
GUI_CREATE_PASS_THROUGH=0x40,
GUI_MODIFY_PASS_THROUGH,
GUI_DELETE_PASS_THROUGH,
GUI_IDENTIFY_DEVICE,
GUI_CREATE_RAIDSET=0x50,
GUI_DELETE_RAIDSET,
GUI_EXPAND_RAIDSET,
GUI_ACTIVATE_RAIDSET,
GUI_CREATE_HOT_SPARE,
GUI_DELETE_HOT_SPARE,
GUI_CREATE_VOLUME=0x60,
GUI_MODIFY_VOLUME,
GUI_DELETE_VOLUME,
GUI_START_CHECK_VOLUME,
GUI_STOP_CHECK_VOLUME
};

```

## Command description

### GUI\_SET\_SERIAL

Set the controller serial#

byte 0,1	length
byte 2	command code 0x10
byte 3	password length (should be 0x0f)
byte 4-0x13	should be "ArEcATecHnoLogY"
byte 0x14--0x23	Serial number string (must be 16 bytes)

### GUI\_SET\_VENDOR

Set vendor string for the controller

byte 0,1	length
byte 2	command code 0x11
byte 3	password length (should be 0x08)
byte 4-0x13	should be "ArEcAvAr"
byte 0x14--0x3B	vendor string (must be 40 bytes)

### GUI\_SET\_MODEL

Set the model name of the controller

byte 0,1	length
byte 2	command code 0x12
byte 3	password length (should be 0x08)
byte 4-0x13	should be "ArEcAvAr"
byte 0x14--0x1B	model string (must be 8 bytes)

### GUI\_IDENTIFY

Identify device

byte 0,1	length
----------	--------

byte 2	command code 0x13 return "Areca RAID Subsystem"
--------	--

## GUI\_CHECK\_PASSWORD

Verify password

byte 0,1	length
byte 2	command code 0x14
byte 3	password length
byte 4-0x??	user password to be checked

## GUI\_LOGOUT

Logout GUI (force password checking on next command)

byte 0,1	length
byte 2	command code 0x15

## GUI\_HTTP

HTTP interface (reserved for Http proxy service)(0x16)

## GUI\_SET\_ETHERNET\_ADDR

Set the ethernet MAC address

byte 0,1	length
byte 2	command code 0x17
byte 3	password length (should be 0x08)
byte 4-0x13	should be "ArEcAvAr"
byte 0x14--0x19	Ethernet MAC address (must be 6 bytes)

## GUI\_SET\_LOGO

Set logo in HTTP

byte 0,1	length
byte 2	command code 0x18
byte 3	Page# (0/1/2/3) (0xff--> clear OEM logo)
byte 4/5/6/7	0x55/0xaa/0xa5/0x5a
byte 8	TITLE.JPG data (each page must be 2000 bytes) <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>page0 1st 2 byte must be actual length of the JPG file</p> </div>

## GUI\_POLL\_EVENT

Poll If Event Log Changed

byte 0,1	length
byte 2	command code 0x19

## GUI\_GET\_EVENT

Read Event

byte 0,1	length
byte 2	command code 0x1a
byte 3	Event Page (0:1st page/1/2/3:last page)

## GUI\_GET\_HW\_MONITOR

Get HW monitor data

byte 0,1	length
byte 2	command code 0x1b
byte 3	# of FANs(example 2)
byte 4	# of Voltage sensor(example 3)
byte 5	# of temperature sensor(example 2)
byte 6	# of power

byte 7/8	Fan#0 (RPM)
byte 9/10	Fan#1
byte 11/12	Voltage#0 original value in *1000
byte 13/14	Voltage#0 value
byte 15/16	Voltage#1 org
byte 17/18	Voltage#1
byte 19/20	Voltage#2 org
byte 21/22	Voltage#2
byte 23	Temp#0
byte 24	Temp#1
byte 25	Power indicator (bit0 power#0, bit1 power#1)
byte 26	UPS indicator

## GUI\_QUICK\_CREATE

Quick create raid/volume set

byte 0,1	length
byte 2	command code 0x20
byte 3/4/5/6	raw capacity
byte 7	raid level
byte 8	stripe size
byte 9	spare
byte 10/11/12/13	device mask (the devices to create raid/volume)

This function is removed, application like to implement quick create function need to use GUI\_CREATE\_RAIDSET and GUI\_CREATE\_VOLUMESET function.

## GUI\_GET\_INFO\_R

Get Raid Set Information

byte 0,1	length
byte 2	command code 0x20
byte 3	raidset#

```
typedef struct sGUI_RAIDSET
{
    BYTE grsRaidSetName[16];
    DWORD grsCapacity;
    DWORD grsCapacityX;
    DWORD grsFailMask;
    BYTE grsDevArray[32];
    BYTE grsMemberDevices;
    BYTE grsNewMemberDevices;
    BYTE grsRaidState;
    BYTE grsVolumes;
    BYTE grsVolumeList[16];
    BYTE grsRes1;
    BYTE grsRes2;
    BYTE grsRes3;
    BYTE grsFreeSegments;
    DWORD grsRawStripes[8];
    DWORD grsRes4;
    DWORD grsRes5; // Total to 128 bytes
    DWORD grsRes6; // Total to 128 bytes
} sGUI_RAIDSET, *pGUI_RAIDSET;
```

## GUI\_GET\_INFO\_V

Get Volume Set Information

byte 0,1	length
byte 2	command code 0x21
byte 3	volumeset#

```
typedef struct sGUI_VOLUMESET
{
    BYTE gvsVolumeName[16]; // 16
    DWORD gvsCapacity;
    DWORD gvsCapacityX;
    DWORD gvsFailMask;
    DWORD gvsStripeSize;
    DWORD gvsNewFailMask;
```

```

        DWORD gvsNewStripeSize;
        DWORD gvsVolumeStatus;
        DWORD gvsProgress; //      32
        sSCSI_ATTR gvsScsi;
        BYTE gvsMemberDisks;
        BYTE gvsRaidLevel; //      8
        BYTE gvsNewMemberDisks;
        BYTE gvsNewRaidLevel;
        BYTE gvsRaidSetNumber;
        BYTE gvsRes0; //      4
        BYTE gvsRes1[4]; //      64 bytes
    } sGUI_VOLUMESET, *pGUI_VOLUMESET;

```

## GUI\_GET\_INFO\_P

### Get Physical Drive Information

byte 0,1	length
byte 2	command code 0x22
byte 3	drive # (from 0 to max-channels - 1)

```

typedef struct sGUI_PHY_DRV
{
    BYTE gpdModelName[40];
    BYTE gpdSerialNumber[20];
    BYTE gpdFirmRev[8];
    DWORD gpdCapacity;
    DWORD gpdCapacityX; //      Reserved for expansion
    BYTE gpdDeviceState;
    BYTE gpdPioMode;
    BYTE gpdCurrentUdmaMode;
    BYTE gpdUdmaMode;
    BYTE gpdDriveSelect;
    BYTE gpdRaidNumber; //      0xff if not belongs to a raid set
    sSCSI_ATTR gpdScsi;
    BYTE gpdReserved[40]; //      Total to 128 bytes
} sGUI_PHY_DRV, *pGUI_PHY_DRV;

```

## GUI\_GET\_INFO\_S

### Get System Information

byte 0,1	length
byte 2	command code 0x23

```

typedef struct sCOM_ATTR
{
    BYTE comBaudRate;
    BYTE comDataBits;
    BYTE comStopBits;
    BYTE comParity;
    BYTE comFlowControl;
} sCOM_ATTR, *pCOM_ATTR;
typedef struct sSYSTEM_INFO
{
    BYTE gsiVendorName[40];
    BYTE gsiSerialNumber[16];
    BYTE gsiFirmVersion[16];
    BYTE gsiBootVersion[16];
    BYTE gsiMbVersion[16];
    BYTE gsiModelName[8];
    BYTE gsiLocalIp[4];
    BYTE gsiCurrentIp[4];
    DWORD gsiTimeTick;
    DWORD gsiCpuSpeed;
    DWORD gsiICache;
    DWORD gsiDCache;
    DWORD gsiScache;
    DWORD gsiMemorySize;
    DWORD gsiMemorySpeed;
    DWORD gsiEvents;
    BYTE gsiMacAddress[6];
    BYTE gsiDhcp;
    BYTE gsiBeeper;
    BYTE gsiChannelUsage;
    BYTE gsiMaxAtaMode;
    BYTE gsiSdramEcc; //      1:if ECC enabled
    BYTE gsiRebuildPriority;
    sCOM_ATTR gsiComA; //      5 bytes
    sCOM_ATTR gsiComB; //      5 bytes
}

```

```

        BYTE gsiIdeChannels;
        BYTE gsiScsiHostChannels;
        BYTE gsiIdeHostChannels;
        BYTE gsiMaxVolumeSet;
        BYTE gsiMaxRaidSet;
        BYTE gsiEtherPort; //      1:if ether net port supported
        BYTE gsiRaid6Engine; //    1:Raid6 engine supported
        BYTE gsiRes[75];
    } sSYSTEM_INFO, *pSYSTEM_INFO;

```

## GUI\_CLEAR\_EVENT

Clear System Event

byte 0,1	length
byte 2	command code 0x24

## GUI\_MUTE\_BEEPER

Mute current beeper

byte 0,1	length
byte 2	command code 0x30

## GUI\_BEEPER\_SETTING

Disable beeper

byte 0,1	length
byte 2	command code 0x31
byte 3	0->disable, 1->enable

## GUI\_SET\_PASSWORD

Change password

byte 0,1	length
byte 2	command code 0x32
byte 3	pass word length ( must <= 15 )
byte 4	password (must be alpha-numerical)

## GUI\_HOST\_INTERFACE\_MODE

Set host interface mode

byte 0,1	length
byte 2	command code 0x33
byte 3	0->Independent, 1->cluster

## GUI\_REBUILD\_PRIORITY

Set rebuild priority

byte 0,1	length
byte 2	command code 0x34
byte 3	0/1/2/3 (low->high)

## GUI\_MAX\_ATA\_MODE

Set maximum ATA mode to be used

byte 0,1	length
byte 2	command code 0x35
byte 3	0/1/2/3 (133/100/66/33)

## GUI\_RESET\_CONTROLLER

Reset Controller

byte 0,1	length
byte 2	command code 0x36 * Response with VT100 screen (discard it)

## GUI\_COM\_PORT\_SETTING

COM port setting

byte 0,1	length
byte 2	command code 0x37



byte 3	0->COMA (term port), 1->COMB (debug port)
byte 4	0/1/2/3/4/5/6/7 (1200/2400/4800/9600/19200/38400/57600/115200)
byte 5	data bit (0:7 bit, 1:8 bit must be 8 bit)
byte 6	stop bit (0:1, 1:2 stop bits)
byte 7	parity (0:none, 1:off, 2:even)
byte 8	flow control (0:none, 1:xon/xoff, 2:hardware => must use none)

#### GUI\_NO\_OPERATION

No operation

byte 0,1	length
byte 2	command code 0x38

#### GUI\_DHCP\_IP

Set DHCP option and local IP address

byte 0,1	length
byte 2	command code 0x39
byte 3	0:dhcp disabled, 1:dhcp enabled
byte 4/5/6/7	IP address

#### GUI\_CREATE\_PASS\_THROUGH

Create pass through disk

byte 0,1	length
byte 2	command code 0x40
byte 3	device #
byte 4	scsi channel (0/1)
byte 5	scsi id (0-->15)
byte 6	scsi lun (0-->7)
byte 7	tagged queue (1 enabled)
byte 8	cache mode (1 enabled)
byte 9	max speed (0/1/2/3/4, async/20/40/80/160 for scsi) (0/1/2/3/4, 33/66/100/133/150 for ide )

#### GUI\_MODIFY\_PASS\_THROUGH

Modify pass through disk

byte 0,1	length
byte 2	command code 0x41
byte 3	device #
byte 4	scsi channel (0/1)
byte 5	scsi id (0-->15)
byte 6	scsi lun (0-->7)
byte 7	tagged queue (1 enabled)
byte 8	cache mode (1 enabled)
byte 9	max speed (0/1/2/3/4, async/20/40/80/160 for scsi) (0/1/2/3/4, 33/66/100/133/150 for ide )

#### GUI\_DELETE\_PASS\_THROUGH

Delete pass through disk

byte 0,1	length
byte 2	command code 0x42
byte 3	device# to be deleted

#### GUI\_IDENTIFY\_DEVICE

Identify Device

byte 0,1	length
byte 2	command code 0x43
byte 3	Flash Method (0:flash selected, 1:flash not selected)
byte 4/5/6/7	IDE device mask to be flashed .. Note:: no response data available

#### GUI\_CREATE\_RAIDSET

#### Create Raid Set

byte 0,1	length
byte 2	command code 0x50
byte 3/4/5/6	device mask
byte 7-22	raidset name (if byte 7 == 0:use default)

#### GUI\_DELETE\_RAIDSET

##### Delete Raid Set

byte 0,1	length
byte 2	command code 0x51
byte 3	raidset#

#### GUI\_EXPAND\_RAIDSET

##### Expand Raid Set

byte 0,1	length
byte 2	command code 0x52
byte 3	raidset#
byte 4/5/6/7	device mask for expansion
byte 8/9/10	(8:0 no change, 1 change, 0xff terminate, 9:new raid level, 10:new stripe size 0/1/2/3/4/5->4/8/16/32/64/128K )
byte 11/12/13	repeat for each volume in the raidset

#### GUI\_ACTIVATE\_RAIDSET

##### Activate incomplete raid set

byte 0,1	length
byte 2	command code 0x53
byte 3	raidset#

#### GUI\_CREATE\_HOT\_SPARE

##### Create hot spare disk

byte 0,1	length
byte 2	command code 0x54
byte 3/4/5/6	device mask for hot spare creation

#### GUI\_DELETE\_HOT\_SPARE

##### Delete hot spare disk

byte 0,1	length
byte 2	command code 0x55
byte 3/4/5/6	device mask for hot spare deletion

#### GUI\_CREATE\_VOLUME

##### Create volume set

byte 0,1	length
byte 2	command code 0x60
byte 3	raidset#
byte 4-19	volume set name (if byte4 == 0, use default)
byte 20-27	volume capacity (blocks)
byte 28	raid level
byte 29	stripe size (0/1/2/3/4/5->4/8/16/32/64/128K)
byte 30	channel
byte 31	ID
byte 32	LUN
byte 33	1 enable tag
byte 34	1 enable cache
byte 35	speed (0/1/2/3/4->async/20/40/80/160 for scsi) (0/1/2/3/4->33/66/100/133/150 for IDE )
byte 36	1 to select quick init

#### GUI\_MODIFY\_VOLUME

##### Modify volume Set

byte 0,1	length
byte 2	command code 0x61
byte 3	volumeset#
byte 4-19	new volume set name (if byte4 == 0, not change)
byte 20-27	new volume capacity (reserved)
byte 28	new raid level
byte 29	new stripe size (0/1/2/3/4/5->4/8/16/32/64/128K)
byte 30	new channel
byte 31	new ID
byte 32	new LUN
byte 33	1 enable tag
byte 34	1 enable cache
byte 35	speed (0/1/2/3/4->async/20/40/80/160 for scsi) (0/1/2/3/4->33/66/100/133/150 for IDE)

#### GUI\_DELETE\_VOLUME

Delete volume set

byte 0,1	length
byte 2	command code 0x62
byte 3	volumeset#

#### GUI\_START\_CHECK\_VOLUME

Start volume consistency check

byte 0,1	length
byte 2	command code 0x63
byte 3	volumeset#

#### GUI\_STOP\_CHECK\_VOLUME

Stop volume consistency check

byte 0,1	length
byte 2	command code 0x64

## 4. Returned data

- A. Header 3 bytes sequence (0x5E, 0x01, 0x61)
- B. Length 2 bytes (low byte 1st, excludes length and checksum byte)
- C. status or data:

1. If length == 1 ==> 1 byte status code:

```
#define GUI_OK 0x41
#define GUI_RAIDSET_NOT_NORMAL 0x42
#define GUI_VOLUMESET_NOT_NORMAL 0x43
#define GUI_NO_RAIDSET 0x44
#define GUI_NO_VOLUMESET 0x45
#define GUI_NO_PHYSICAL_DRIVE 0x46
#define GUI_PARAMETER_ERROR 0x47
#define GUI_UNSUPPORTED_COMMAND 0x48
#define GUI_DISK_CONFIG_CHANGED 0x49
#define GUI_INVALID_PASSWORD 0x4a
#define GUI_NO_DISK_SPACE 0x4b
#define GUI_CHECKSUM_ERROR 0x4c
#define GUI_PASSWORD_REQUIRED 0x4d
```

2. If length > 1:

data block returned from controller and the contents depends on the command code

- E. Checksum checksum of length and status or data byte