

Broadcom-Nintendo

Wireless Library Command Specification

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1. Outline

The Broadcom-Nintendo library is a translation layer between the Nintendo Wireless Manager(WD) and the Broadcom wireless driver ("wl"). It is an IOCTL layer similar to wl_oid.c & wl_iw.c. It takes commands issued by WD and turns them into a format understandable by wl and issues the appropriate wl commands. It takes unsolicited indications (e.g. received packets, event notifications, etc) from the Broadcom wireless driver and turns them into a format understandable by WD.

Some terminology:

Generally we refer to a wireless station performing the access point functions as "AP". Unless otherwise stated, all references to a parent or AP refer to both, i.e. parent/AP.

Likewise we refer to a wireless station that must access an AP as a "STA". Unless otherwise stated, all references to a child or STA refer to both, i.e. child/STA.

Major Changes from Revision 0.06:

-1- Remove Set SSID command

-2- Changes to following sections:

5-1: Format

Computation of length field was incorrect: fixed

5-2-2 [ID: 0002h] MLME-Scan.Request

Eliminate BSSID exclusion.

5-2-3: [ID: 0003h] MLME-Join.Request

Set Join Timeout to constant, change associated field in request to "Reserved"

5-2-6: [ID:000Ah] MLME-MeasureChannel.Request

Remove "XXX:" comments.

5-4-2: [ID:0182h] MA-MP.Indication

Noted Nintendo's request to make sure Nitro frames are included in the moving averages we provide for RSSI & Rate info.

5-4-3: [ID:0184h] MA-MPEND.Indication

We are unable to figure out how to use this field hence have eliminated it.

5-5-1: [ID:0100h] Set All Parameter Command

Added fields for WPA parameters.

5-5-15: [ID: 020Eh] Set Preamble Type Command

We cannot support setting and OFDM preamble for CCK rates. This is noted in the command description. We reviewed the 802.11 specifications and found no section requiring

this capability. So far as we know we are fully 802.11 compliant. Is there a section of the 802.11 specification to which you can refer us?

5-5-20: [ID:0215h] Set Beacon Recv Indication Command

Altered to allow independent enable/disable of receive and send beacon indications.

5-6-37: [ID:0309h] Set Signal Command

We are unable to support the command as written in your proposal. What we can support is three modes (test tone, suppressed carrier, and EVM). WE have used these successfully to verify our parts for production.

Note that if you want to send arbitrary data patterns you can do so within the ethernet encapsulation requirements of the MA-Send.Request [ID: 0100h] command. You can also choose the rate for this. The modulation type will be selected according to whether the chosen rate is CCK or OFDM.

-3- Changes to security commands as requested by Nintendo:

We have followed the proposal you made for incorporating WPA settings into the existing set/get framework for WEP commands. (0206, 0207, 0208, 024A, 0286, 0287)

We have deleted the Get WPA Security Command (02CAh) per your request.

-4- Changes to the Set Country [ID: 0203h] Command

We have removed Table 5-1. We will forward to you information about channels supported for different country codes in a separate document.

-5- Set SSID [ID: 0241h] Command

This has been deleted per Nintendo request (and Broadcom recommendation).

-6- Get RSSI and Rate [ID: 02C6h] Command

We have added the transmit rate field per your request.

-7- MA-Data.Indication [ID: 0180h]

This has been reworked. Our design review identified two issues with it:

(a) many "Reserved", apparently useless fields

(b) the data field was on a 2 byte boundary

Reasons:

Our hardware returns the data portion of a frame on a 4 byte boundary. It is advantageous to maintain this alignment. Note that in this case we define the data portion of a frame as where the encapsulated data begins. For an IP frame it would be the beginning of the IP header.

If you wish to have some additional reserved fields or, if you wish to add some additional information to the indication, please advise us. Our principal concern is maintaining the four byte alignment of the data portion. We can be flexible about the rest.

-8- Our design review identified the following:

It is advantageous to have all requests contained in one contiguous buffer, i.e. the iosobuf data section should NOT chain buffers together but rather use one contiguous buffer.

This is again an efficiency consideration. Among the reasons:

- The SDIO hardware we will be using does not support scatter-gather operations. This means chained buffers would require software intervention and this would be burdensome overhead.
- All WL commands would be greatly burdened were it necessary to check for – and possibly coalesce – chained buffers in order to parse and execute any given command. This is also an unwelcome amount of overhead.

We therefore must establish the requirement that all command buffers be contiguous and NOT chained.

Changes from Revision 0.06:

Delete Set SSID command: not useful.

Rework MA-Data Request (0x100) for 4 byte alignment of data field.

Change Test Signal Command.

Changes from Revision 0.07:

Add Get Scan Results Command.

Correct length field in Scan Request.

Remove Reserved field in confirm section of scan request.

Add length and reserved field to 0x102, MP Data request

Restore length field in 0x101, Key Data Request, add reserved field to force 4 byte alignment.

Fix alignment error in MA-Indicate. Delete reserved field.

Changes from Revision 0.08:

Add Scan, Join, Measure Channel complete indications.

Change Table 4-1: Rate set only allowed when IDLE.

Remove return BSS description info from Scan confirm.

Remove peer mac address from Join confirm.

Modify IE fields in BSS description (part of Join cmd description)

Changes from Revision 0.09:

Correct Errors in “country code/allowed channels” cmd: lengths wrong

Change Rate field to reserved in set/get all commands.

Correct errors in Beacon Receive Indication: Rate, RSSI should each be 2 byte fields.

Correct Set Gameinfo entry in Table 4-1: settable at all levels.

Change Cmds 205/285 to be set/get of rateset, not rate

Remove Get Scan results command.

Changes from Revision 0.10:

Add AID field to join indication per Nintendo request.

Correct descriptions of scan, join, and measure channel per Nintendo request.

Use common format for mac address entries in command descriptions.

Change “ASS” in names/descriptions to “ASSOC”.

Fix error: join complete showed 0x82 in packet fields, change to be 0x83.

Fix error: Get RSSI command (02CCh) showed incorrect command code in packet fields.

Add cursory description of Linux and IOPOS interfaces to WL in sec 4-2-1.

Uprev to 0.11.

Changes from Revision 0.11:

Uprev to 0.12

Add better Linux interfacing guide in sec 4-2-1.

Change footer for latest legal notices.

Add changelog for v0.12

Changes from Revision 0.12:

Uprev to 0.13

Add changelog sections for v0.06 → v0.09

Add changelog for changes from v0.12 to v0.13

Changes from Revision 0.13:

Uprev to 0.14

Add changelog for 0.13 → 0.14

Add note to cmd 008h (disassociate request): sta ignores peer mac and reason code.

Remove default designator from Use Antenna portion of cmd 0x214: this is ignored when diversity is on which is also default setting.

Add note to cmd 20fh, set auth mode: OPEN_SYSTEM is default.

Changes from Revision 0.14:

Uprev to 0.15

Add changelog for 0.14 → 0.15

Remove child mode from command 0204h, Set operation mode.

Changes from Revision 0.15:

Uprev to 0.16

Add changelog for 0.15 → 0.16

Minor spelling correction, jon → join.

Add clarifications in Ma-Data.Request (100h).

Add notes to Join command (003h) documenting behavior for infrastructure and ibss cases.

Changes from Revision 0.16:

Uprev to 0.17

Add changelog for 0.16 → 0.17

Major changes to Measure Channel Indication (008Ah).

Correct spelling error in footer. Up copyright to 2006.

Changes from Revision 0.17:

Uprev to 0.18

Add changelog for 0.17 → 0.18

Add clarifying comments to Get RSSI command (0x2CC).

Changes from Revision 0.18:

Uprev to 0.19

Add changelog for 0.18 → 0.19

Recast Get Wireless Counters Cmd (0x307) to use Broadcom rx, tx stats

Add code examples for IOPOS interface in section 4-2-1.

Remove Clr Data Request (0x104)

Add descriptions of indications issued by Fatal Error Indication (0x186).

Add Note requesting removal of TimeOut Indication (0x187).

Changes from Revision 0.19:

Uprev to 0.20

Add changelog for 0.19 → 0.20

Change Get Wireless Counters Cmd (0x307) to use version et al from Broadcom data structures. Correct error in length field, add clarifying comments.

Changes from Revision 0.20:

Uprev to 0.21

Add changelog for 0.20 → 0.21

Change Table 4-1: cmds 209, 20A, 20B are permitted in Class3 mode.

Change Table 4-1: cmd 00A is NOT permitted in Class3 mode

Rework Indication 0180h: this indication returns the entire Ethernet frame now.

Changes from Revision 0.21:

Uprev to 0.22

Change scan request (cmd 02h) to use a bit vector for participating channels.

Change measure channel request (cmd 0Ah) to use a bit vector for participating channels.

Revised description of Lifetime cmd (211h) per Nintendo request.

Naming, formatting, phrasing, and cleanup edits per Nintendo request.

Remove Set BSSID (0240h) command: not needed.

Revise Table 4-1 per command requirements.

Changes from Revision 0.22:

Uprev to 0.23

Add note to Set frag thresh 0x249 for min and max values

Miscellaneous cleanup edits

Add table of parameters and default values for cmd 0x304

Changes from Revision 0.23:

Uprev to 0.24

Add MA-Channel_Use.Indication (0190h) for Bluetooth coexistence.

Add clarification for cmd 247, Set Allow/Deny MAC Address Cmd

Cleanup edit in cmd309: wrong cmd id in confirm field.

Add clarifying comments to cmd 309 discussing nature and usage of test signal types.

Cmd 309 is intended to operate in IDLE mode only. Change Table 4-1 appropriately.

Add Set/Get TX Power Command 0x24D, 0x2CD respectively

Changes from Revision 0.24:

Uprev to 0.25

Add Set/Get Multicast Rate Command 0x24E, 0x2CE respectively

Add MA-IAPP.Indication 0x191

Add clarifying notes on usage of of Set TX Power Command (0x24D)

Changes from Revision 0.25:

Uprev to 0.26

Fill in details of Set/Get EEROM Command (0x24B/0x2CB)

Changes from Revision 0.26:

Uprev to 0.27

Repair documentation of Set/Get Multicast Rate Command (0x24E/0x2CE)

Modify comments for clarity in Set EEROM Command (0x24B)

Changes from Revision 0.27:

Uprev to 0.28

Revise Get RSSI and Rate Info Command (0x2CC)

Correct errors in Table 4-1

Changes from Revision 0.28:

Uprev to 0.29

Add clarifying comments to Set Max Connectable Child Command (212h)

Add clarifying comments to Set Operation Mode Command (204h)

Changes from Revision 0.29:

Uprev to 0.30

Add clarifying comments to Set Max Connectable Child Command (212h): allow zero

Changes from Revision 0.30:

Uprev to 0.31

Redefine "Reserved" field in MpEndData of MA-MPEND indication (184h) as "Current TSF"

Changes from Revision 0.31:

Uprev to 0.32

Add Set/Get Tx Antenna Command (0x213/0x293)

Changes from Revision 0.32:

Uprev to 0.33

Change the supported values for RetryLimit in MA-MP.Request(102h) to 0-15.

Changes from Revision 0.33:

Uprev to 0.34

Add WPA-PSK(AES) mode to Set Security Mode Command (206h)

Changes from Revision 0.34:

Uprev to 0.35

Undo changes for rev 0.33: change supported values for Retry Limit in MA-MP.Request (102h) to 0-256. Maximum retry limit of 15 will be documented in release notes.

Changes from Revision 0.35:

Uprev to 0.36

Add clarifying note for WPA-PSK(AES) operation in Set Security Mode Command (0x206).

Remove “Preliminary” watermark from document background.

Changes from Revision 0.36:

Uprev to 0.37

Add clarifying note that Gameinfo Information Element is added to Beacon Frames only in Parent mode.

Changes from Revision 0.37:

Uprev to 0.38

Add pkt count statistics to Get Wireless Counter Command (0x307).

Changes from Revision 0.38:

Uprev to 0.39

Add Set/Get Interference Mode Command (0x216/0x296)

2. Command List

The following shows the command list supported.

Table. 2-1 Wireless Library Command Group List

ID	Description
0000h-003Fh	MLME Command Group
0040h-007Fh	Reserved
0080h-00BFh	MLME-INDICATION Group
00C0h-00FFh	Reserved
0100h-013Fh	MA-REQUEST Group
0140h-017Fh	Reserved
0180h-01BFh	MA-INDICATION Group
01C0h-01FFh	Reserved
0200h-027Fh	Parameter Set Command Group
0280h-02FFh	Parameter Get Command Group
0300h-03FFh	Device Command Group
0400h-FFFFh	Reserved

Table 2-2 MLME Command Group List

ID	Description
0000h	MLME-Reset.Request
0001h	
0002h	MLME-Scan.Request
0003h	MLME-Join.Request
0004h	
0005h	
0006h	
0007h	
0008h	MLME-Disassociate.Request
0009h	MLME-Start.Request
000Ah	MLME-Measure_Channel.Request
000Bh-003Fh	

Table. 2-3 MLME-INDICATION Group List

ID	Description
0080h	
0081h	
0082h	MLME-Scan.Indication
0083h	MLME-Join.Indication
0084h	
0085h	
0086h	MLME-Associate.Indication
0087h	
0088h	MLME-Disassociate.Indication
0089h	
008Ah	MLME-Measure_Channel.Indication
008Bh	MLME-Beacon_Lost.Indication
008Ch	MLME-Beacon_Send.Indication
008Dh	MLME-Beacon_Recv.Indication
008Eh-00BFh	

Table. 2-4 MA Command Group List

ID	Description
0100h	MA-Data.Request
0101h	MA-KeyData.Request
0102h	MA-MP.Request
0103h	
0104h	
0105h-013Fh	

Table. 2-5 MA-INDICATION Group List

ID	Description
0180h	MA-Data.Indication
0181h	
0182h	MA-MP.Indication
0183h	
0184h	MA-MPEND.Indication
0185h	MA-MPACK.Indication
0186h	MA-Fatal_Err.Indication
0187h	MA-Time_Out.Indication
0188h-018Fh	
0190h	MA-Channel_Use.Indication
0191h	MA-IAPP.Indication
0192h-01FFh	

Table 2-6: Parameter Setting Command Group

ID	Description
0200h	Set All Parameters Command
0201h	Set MAC address Command
0202h	Set Retry Limits Command
0203h	Set Country Command
0204h	Set Operation Mode Command
0205h	Set Rateset Command
0206h	Set Security Mode Command
0207h	Set WEP Default KeyID Command
0208h	Set WEP Keys Command
0209h	Set Beacon Frame Type Command
020Ah	Set Broadcast SSID Probe Response Command
020Bh	Set BeaconLostThreshold Command
020Ch	Set Active Zone Command
020Dh	Set SSID Mask Command
020Eh	Set Preamble Type Command
020Fh	Set Authentication Algorithm Command
0210h	
0211h	Set LifeTime Command
0212h	Set Max Connectable Child Command
0213h	Set Tx Antenna Command
0214h	Set Antenna Diversity Command
0215h	Set Enable Beacon Send/Recv Indication Command
0216h	Set Interference Mode Command
0217h- 023F	Reserved
0240h	
0241h	
0242h	Set Beacon Period Command
0243h	Set DTIM Period Command
0244h	
0245h	SetGameInfo Command
0246h	Set VBlank_TSF Command
0247h	Set Allow/Deny MAC Address List Command
0248h	Set RTS Threshold Command
0249h	Set FragmentationThreshold Command
024Ah	Set WPA Passphrase Command
024Bh	Set EEROM Content Command
024Ch	
024Dh	Set TX Power Command
024Eh	Set Multicast Rate Command
024Fh- 027Fh	

Table 2-7: Parameter Get Command Group

ID	Description
0280h	Get All Command
0281h	Get MAC Address Command
0282h	Get Retry Limits Command
0283h	Get Enabled Channels Command
0284h	Get Operation Mode Command
0285h	Get Rateset Command
0286h	Get Security Mode Command
0287h	Get WEP Default KeyID Command
0288h	
0289h	Get Beacon Frame Type Command
028Ah	Get Broadcast SSID Probe Response Command
028Bh	Get BeaconLost Threshold Command
028Ch	Get Active Zone Command
028Dh	Get SSID Mask Command
028Eh	Get Preamble Type Command
028Fh	Get Authentication Mode Command
0290h	
0291h	
0292h	Get Max Connectable Child Command
0293h	Get Tx Antenna Command
0294h	Get Antenna Diversity Command
0295h	Get Enable Beacon Send/RecvIndication Command
0296h	Get Interference Mode
0297h- 02BF	
02C0h	Get BSSID Command
02C1h	Get SSID Command
02C2h	Get Beacon Period Command
02C3h	Get DTIM Period Command
02C4h	
02C5h	Get GameInfo Command
02C6h	Get Vblank TSF Command
02C7h	Get MAC List Command
02C8h	Get RTS Threshold Command
02C9h	Get Fragmentation Threshold Command
02CAh	
02CBh	Get EEROM Content Command
02CCh	Get RSSI and Rate Info Command
02CDh	Get TX Power Command
02CEh	Get Multicast Rate Command
02CFh- 02FFh	

Table 2-8: Device Command Group

ID	Description
0300h	
0301h	
0302h	IDLE Command
0303h	CLASS1 Command
0304h	Restart Command
0305h	Init Wireless Counter Command
0306h	Version Command
0307h	Get Wireless Counter Command
0308h	Get Station State Command
0309h	Test Signal Command
030Ah- 03FFh	

3. Status Codes

Table 3-1: Result Status Code List

ID	Description
0000h	SUCCESS
0080h	OPERATING
0001h	STATE_IS_WRONG
0002h	REQUEST_BUSY
0003h	NOT_SUPPORT
0004h	LENGTH_ERROR
0005h	INVALID_PARAMETERS
0006h	REFUSE
0007h	TIMEOUT
0008h	NOT_ENOUGH_MEMORY
0009h	NOT_ENOUGH_PARAMETER
000Ah	NOT_CLASS3_STA_FRAME
000Bh	ILLEGAL_MODE
000Ch	FAILURE
000Dh	CONFIRM_CODE_ERR
000Eh	FLASH_ERR

SUCCESS: command successfully executed

OPERATING: command is executing (in the process of executing the command)

WRONG_STATE: this command cannot be executed at this state

BUSY: cannot executed the currently requested command because the system is busy executing other command

CMD_NOT_SUPPORT: command ID is invalid

LENGTH_ERROR: length is invalid

INVALID_PARAMETERS: parameter is invalid

REFUSE: command has been refused

TIMEOUT: command is finished due to timeout

NOT_ENOUGH_MEMORY: buffer memory is not enough

NOT_ENOUGH_PARAMETER: input parameters are not enough

NOT_CLASS3_STA_FRAME: received CLASS3 frame from station that is not belong to CLASS3 state

ILLEGAL_MODE: this command cannot be executed at this current mode

FAILURE: command cannot be ended normally

CONFIRM_CODE_ERR: Confirm field code is invalid

FLASH_ERR: RAM stored Flash image checksum is not matched

Table 3-2 ReasonCode List

0000h	RSN_RESERVED
0001h	RSN_UNSPECIFIED
0002h	RSN_PREV_AUTH_INVALID
0003h	RSN_DEAUTH_LEAVING
0004h	RSN_INACTIVE
0005h	RSN_UNABLE_HANDLE
0006h	RSN_RX_CLASS2_FROM_NONAUTH_STA
0007h	RSN_RX_CLASS3_FROM_NONASSOC_STA
0008h	RSN_DISASSOC_LEAVING
0009h	RSN_ASSOC_STA_NOTAUTHED
000Ah- 0012h	Reserved
0013h	RSN_NO_ENTRY

RSN_RESERVED: reserved

RSN_UNSPECIFIED: unspecified error

RSN_PREV_AUTH_INVALID: previously authentication is no longer valid

RSN_DEAUTH_LEAVING: Got Deauthentication because of leaving BSS

RSN_INACTIVE: Got Disassociation due to inactive

RSN_UNABLE_HANDLE: Got DisAssociation due to inability to handle all the connecting child machines

RSN_RX_CLASS2_FROM_NONAUTH_STA: received CLASS2 frame from nonauthenticated child station

RSN_RX_CLASS3_FROM_NONASSOC_STA: received CLASS3 frame from nonassociated child station

RSN_DISASSOC_LEAVING: Got Disassociation because of leaving BSS

RSN_ASSOC_STA_NOTAUTHED: no authentication is granted to child station who tried to reconnect again (tried to associate again but no authentication is granted)

RSN_NO_ENTRY: cannot be taken as entry

Table 3-3 Status Code List

0000h*1)	STS_SUCCESS
0001h	STS_UNSPECIFIED
0002h-0009h	Reserved
000Ah	STS_NOT_SUPPORT_CAPABILITY
000Bh	STS_REASSOC_INABILITY
000Ch	STS_OUT_OF_STANDARD
000Dh	STS_NOT_SUPPORT_AUTH_ALGORITHM
000Eh	STS_OUT_OF_AUTH_SEQ_NUM
000Fh	STS_CHALLENGE_FAILURE
0010h	STS_AUTH_TIMEOUT
0011h	STS_ASSOC_UNABLE_HANDLE
0012h	STS_INVALID_BASICRATESET
0013h	STS_NO_ENTRY

STS_SUCCESS (SUCCESS): successfully executed

STS_UNSPECIFIED: unspecified failed

STS_NOT_SUPPORT_CAPABILITY: unable to support all functions that are indicated by Capability Information

STS_REASSOC_INABILITY: reassociation got rejected because the first association confirmed to be not existed. (since it cannot confirm the existence of association, reassociation is rejected)

STS_OUT_OF_STANDARD: association (connection) is refused because it's out of standard specification

STS_NOT_SUPPORT_AUTH_ALGORITHM: authentication algorithm that is not supported

STS_OUT_OF_AUTH_SEQ_NUM: received Authentication frame that is out of authentication sequence number

STS_CHALLENGE_FAILURE: challenge text failed

STS_AUTH_TIMEOUT: during authentication sequence, the timeout occurs. (time that waits for next frame)

STS_ASSOC_UNABLE_HANDLE: association got rejected because parent is unable to handle additional child station

STS_INVALID_BASICRATESET: the child that requested association cannot support all the communication rate indicated by parent's BasicRateSet

STS_NO_ENTRY: cannot be taken as entry

4. Wireless Library

4-1. State Machines

Fig 4-1, Fig 4-2 show Parent/AP mode and Child/STA mode state machine diagrams respectively.

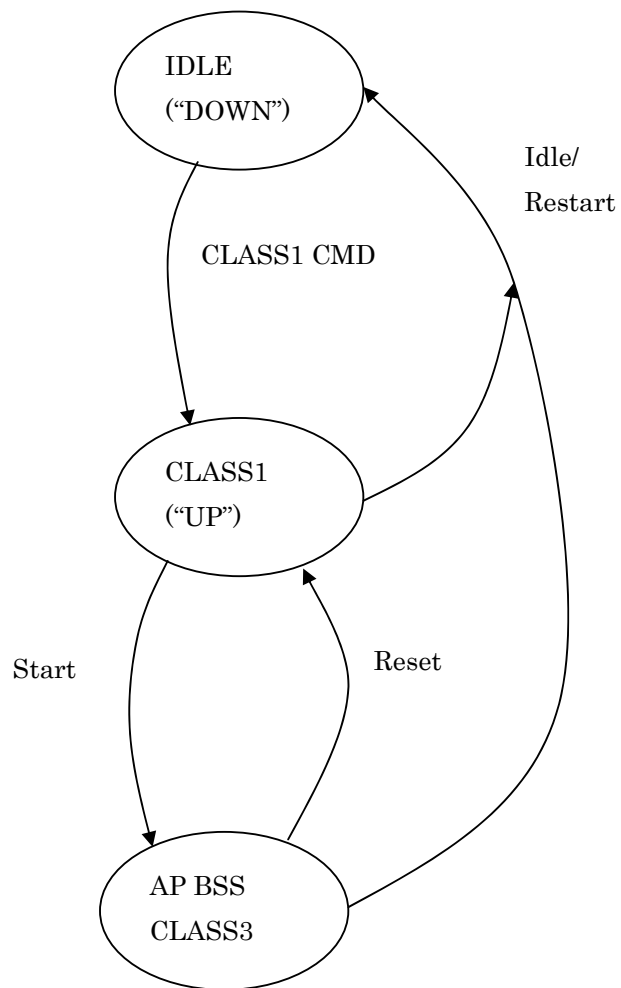


Fig 4-1: AP/Parent State Machine

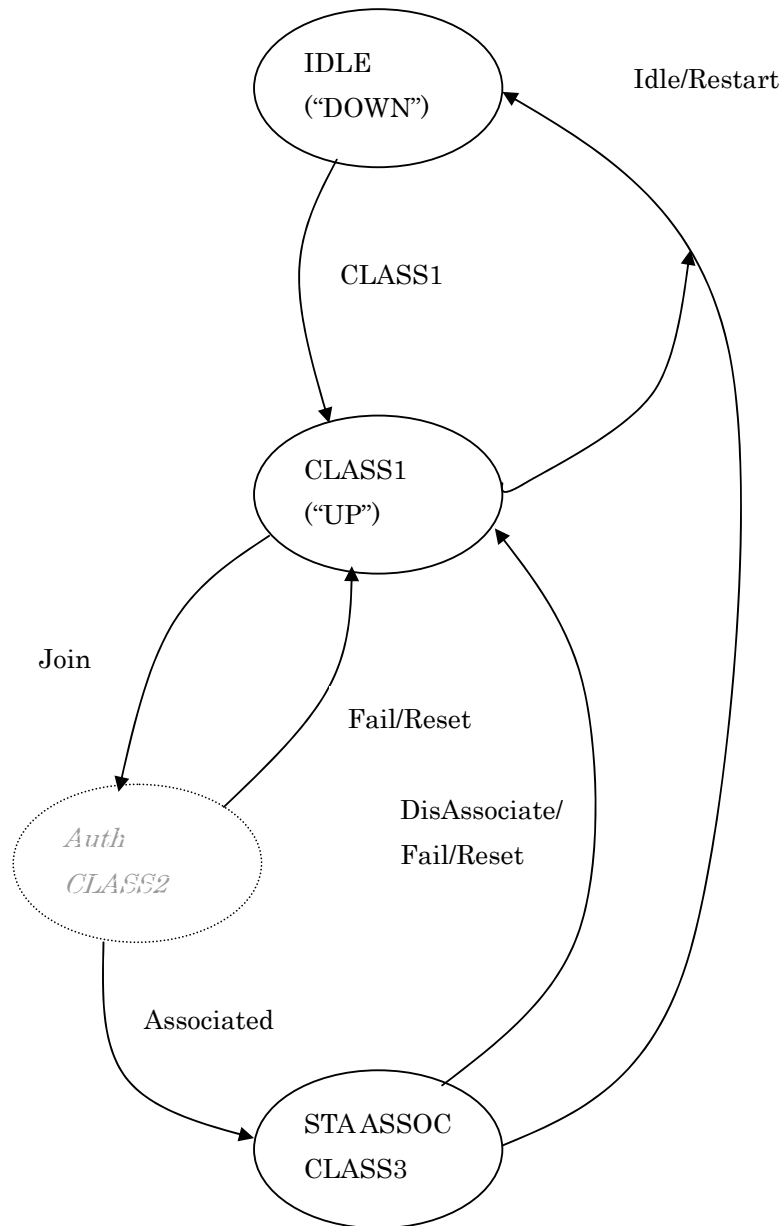


Fig 4-2: STA/child State Machine

Note: Join command proceeds automatically through CLASS2 to CLASS3 state. If either Authentication or Association fails WL will fall back to CLASS1 state.

Following are IFS values.

All values are in microseconds.

```
#define BPHY_SLOT_TIME          20      /* BPHY slot time */
#define BPHY_SIFS_TIME          10      /* BPHY SIFS time */
#define BPHY_DIFS_TIME          50      /* BPHY DIFS time */
#define BPHY_PLCP_TIME          192     /* BPHY PLCP time */
#define BPHY_PLCP_SHORT_TIME     96     /* BPHY PLCP short time */
```

EIFS is more involved and is done in the hardware. We follow the 802.11 requirements:

$$\text{EIFS} = \text{SIFS} + *8 * \text{ACKSize}) + \text{PreambleLength} + \text{PLCPHeaderLength} + \text{DIFS}$$

We use the same values for the Nitro protocol as for 802.11 b/g

4-2. Wireless Library Usage

4-2-1. WD-WL Communication

All communication between WD and WL is handled in an OS dependent interface. On Linux this interface uses sockets and read/write calls. On IOPOS the proposed interface is an IOPOS_ioctl call for commands and a separate queue for posting asynchronous indications.

When WD issues a command, a command packet pointer is sent to WL via the OS dependent interface. WL receives the message and processes the command. When the command is done the command packet pointer is returned via the OS interface. WD will receive and interpret the command result.

Asynchronous indications will be read from a socket (Linux) or a queue (IOPOS).

These OS dependent adaptations will be discussed in detail in a separate specification.

General (applicable to all):

Buffer sizes should be chosen so as to handle the largest possible response for the particular command. While buffer chaining is possible for IOPOS iosbufs it is not supported by the driver.

Linux:

Commands are sent via ioctl calls. The buffers containing the formatted commands are “flat”, i.e. locally allocated contiguous virtual memory buffers.

Commands that expect a [synchronous] response will have the results in the buffer supplied to the ioctl command. Asynchronous responses and indications are sent as the body of an Ethernet frame to a socket.

IOPOS:

Commands are sent via IOS_Ioclt() calls.

Command buffers are the “data” portion of an ioposbuf. In general these should be flat and contiguous as for Linux. Chaining iosiobufs is not supported by the driver.

Commands that expect a synchronous response will have the results returned by the ioctl command.

Asynchronous responses and indications are sent via a separate IOPOS queue.

Here are some code snippets illustrating the usage:

Linux:

Synchronous command:

We will use the “set RTS threshold” command in this example.

First, allocate a buffer and format as follows:

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0248h															
	7	1															
	8	RTS Threshold															
Conf rm	9	0248h															
	10	1															
	11	Result Sts Code															

We will set the “Reserved” field to all zeroes.

The RTS Threshold field may be set to 1535 bytes (0x5FF).

The Result Sts Code will be set appropriately when the command executes.

Next, open a socket to the wl interface and send the formatted command buffer via an ioctl call:

static int

wl_ioctl(void *wl, int cmd, void *buf, int len, bool set)

```
{
    struct ifreq *ifr = (struct ifreq *) wl;
    wl_ioctl_t ioc;
    int ret = 0;
    int s;

    /* open socket to kernel */
    if ((s = socket(AF_INET, SOCK_DGRAM, 0)) < 0)
        syserr("socket");

    /* do it */
    ioc.cmd = cmd;
    ioc.buf = buf;
    ioc.len = len;
```



```
        ioc.set = set;
        ifr->ifr_data = (caddr_t) &ioc;
        if ((ret = ioctl(s, NWD_SIOCDEVPRIVATE_NINTENDO, ifr)) < 0) {
            if (cmd != WLC_GET_MAGIC) {
                ret = IOCTL_ERROR;
            }
        }

        /* cleanup */
        close(s);
        return ret;
    }
}
```

Where:

wl = pointer to struct ifreq containing the relevant interface name, e.g. eth1

cmd = 1

buf = our formatted command buffer

len = length of formatted command buffer

set = 0

struct ifreq is defined in include/linux/if.h

/* Linux network driver ioctl encoding */

```
typedef struct wl_ioctl {
    uint cmd; /* common ioctl definition */
    void *buf; /* pointer to user buffer */
    uint len; /* length of user buffer */
    bool set; /* get or set request (optional) */
    uint used; /* bytes read or written (optional) */
    uint needed; /* bytes needed (optional) */
} wl_ioctl_t;
```

Asynchronous response/indication:

Open a socket and listen:

```
fd = open_socket((struct ifreq *)wl);
    if (fd < 0)
        syserr("wlnin_listen: open_socket error");
```

```
len = recv(fd, rcvpkt, sizeof(rcvpkt), 0);
```

Where:

static int

open_socket(struct ifreq *ifr)

```
{
    int fd, err;
    struct sockaddr_ll sll;

    fd = socket(PF_PACKET, SOCK_RAW, htons(ETHER_TYPE_BRCM));
    if (fd < 0) {
        fprintf(stderr, "Cannot create socket %d\n", fd);
        return -1;
    }

    err = ioctl(fd, SIOCGIFINDEX, ifr);
    if (err < 0) {
        fprintf(stderr, "Cannot get index %d\n", err);
        return -1;
    }

    memset(&sll, 0, sizeof(sll));
    sll.sll_family = AF_PACKET;
    sll.sll_protocol = htons(ETHER_TYPE_BRCM);
    sll.sll_ifindex = ifr->ifr_ifindex;
    err = bind(fd, (struct sockaddr *)&sll, sizeof(sll));
    if (err < 0) {
        fprintf(stderr, "Cannot get index %d\n", err);
        return -1;
    }

    return fd;
}
```

```
}
```

The formatted asynchronous response/indication will be found at a 14 bytes offset from the beginning of the rcvpkt buffer.

IOPOS Usage:

Note: the following snippets are taken from the file wlnin_iop.c

To send commands and packets:

Note that the contents of buf are the same as in the Linux example.

```
static int
wlnin_ioctl(void *wl, int cmd, void *buf, int len, bool set, int scmd)
{
    IOSFd fd;
    struct ifreq *ifr = (struct ifreq *) wl;
    IOSIobuf *iob;
    IOSIobDebugInfo dbg;
    int ret = 0;

    /* Everything fits inside a 2k buffer, by decree */
    iob = IOS_AllocIob(POOL_DEFAULT, 2048, dbg);
    if (iob == NULL) {
        printf("%s: failed to allocate iobuf\n", __FUNCTION__);
        return -1;
    }
    iob->data = iob->head;
    iob->dataLen = len;

    #if 0
        /* WAR : IOPOS is not initializing the data correctly */
        iob->bufLen = 2048;
        /* end WAR */
    #endif
}

#endif
```

```
/* Set data pointer to end of structure, place data there */
memcpy(iob->data, buf, len);

/* XXX: flags ? */
fd = IOS_Open(ifr->ifr_name, 0);
if (fd < 0 ) {
    printf("%s: error opening %s¥n", __FUNCTION__, ifr->ifr_name);
    printf("%s: fd is 0x%x¥n", __FUNCTION__, fd);
    return -1;
}

/* XXX: len is spurious, iobufs are globally rw */
IOS_Ioctl(fd, scmd, iob, len, 0, 0);

/* Repeat: Everything fits inside a 2k buffer, by decree */
memcpy(buf, iob->data, len);
ret = IOS_Close(fd);
if (ret)
    printf("%s: error %d closing rm descriptor¥n", __FUNCTION__, ret);
ret |= IOS_FreeIob(iob);
if (ret)
    printf("%s: error %d closing rm descriptor¥n", __FUNCTION__, ret);
return ret;
}
```

To receive an indication:

```
int
wlnin_rcv_pkt(int fd, char *pbuf, int buflen, int flags)
{
    IOSError err;
    IOSMessage msg;
    IOSIobuf *iob;
    int ioblen, length_to_copy;

    if ((err = IOS_ReceiveMessage(fd, &msg, IOS_MESSAGE_BLOCK)) !=
```

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```
IOS_ERROR_OK) {
    printf("IOS_ReceiveMessage failed, err %d", err);
    goto done;
}

/* should be an iobuf */
iob = (IOSIobuf *)msg;
prhex(NULL, IOS_IOB_DATA(iob), MIN(ioblen,32));

/* XXX: need some defensive checks here */
ioblen = IOS_IOB_DATA_LEN(iob);

/* XXX: need to handle chained buffers too */
length_to_copy = MIN(ioblen, buflen);
if (length_to_copy < ioblen) {
    printf("%s: packet truncated, buffer len %d too short recv len %d %n",
        __FUNCTION__, buflen, ioblen);
}
bcopy((char *)IOS_IOB_DATA(iob), pbuf, length_to_copy);
err = IOS_FreeIob(iob);
if (err) {
    printf("%s: ERROR freeing iobuf %p%n", __FUNCTION__, iob);
    goto done;
}

done:
    return err ? -1 : length_to_copy;
}
```


4-2-2. State Operation

Table 4-1 shows the operations permitted for given states.

Note: No commands may be executed in CLASS2 state.

Table 4-1 Each Command Executable State

Code	Name	IDLE	CLASS1	CLASS3
0000h	MLME-Reset.Request		○	○
0001h				
0002h	MLME-Scan.Request		○	○
0003h	MLME-Join.Request		○	
0004h				
0005h				
0006h				
0007h				
0008h	MLME-DisAssociate.Request			○
0009h	MLME-Start.Request		○	
000Ah	MLME-MeasureChannel.Request		○	
0100h	MA-DATA.Request			○
0101h	MA-KeyData.Request			○
0102h	MA-MP.Request			○
0103h				
0104h				
0200h	Set All Parameters Command	○	○	
0201h	Set MAC Address Command	○		
0202h	Set Retry Limits Command	○	○	○
0203h	Set Country Command	○		
0204h	Set Operation Mode Command	○	○	
0205h	Set Rateset Command	○		
0206h	Set Security Mode Command	○	○	
0207h	Set WEP Default KeyID Command	○	○	
0208h	Set WEP Keys Command	○	○	
0209h	Set Beacon Frame Type Command	○	○	○
020Ah	Set Beacon SSID Probe Response Command	○	○	○
020Bh	Set Beacon Lost Threshold Command	○	○	○
020Ch	Set Active Zone Command	○	○	○
020Dh	Set SSID Mask Command	○	○	
020Eh	Set Preamble Command	○	○	○
020Fh	Set Authentication Algorithm Command	○	○	
0210h				
0211h	Set LifeTime Command	○	○	
0212h	Set Max Connectable Child Command	○	○	
0213h	Set Tx Antenna Command	○	○	○
0214h	Set Antenna Diversity Command	○	○	○
0215h	Set Enable Beacon Send/Receive Indication	○	○	○

Code	Name	IDLE	CLA SS1	CLA SS3
	Command			
0216h	Set Interference Mode Command	○	○	○
0240h				
0241h				
0242h	Set Beacon Period Command	○	○	○
0243h	Set DTIM Period Command	○	○	○
0244h				
0245h	Set GameInfo Command	○	○	○
0246h	Set VBlank_TSF Command			○
0247h	Set Allow/Deny MAC Address List Command	○	○	○
0248h	Set RTS Threshold Command	○	○	○
0249h	Set Fragmentation Threshold Command	○	○	○
024Ah	Set WPA Passphrase Command	○	○	
024Bh	Set EEROM Content Command	○		
024Dh	Set TX Power Command			○
024Eh	Set Multicast Rate Command	○	○	○
0280h	Get All Parameters Command	○	○	○
0281h	Get MAC Address Command	○	○	○
0282h	Get Retry Limits Command	○	○	○
0283h	Get Enabled Channel List Command	○	○	○
0284h	Get Operation Mode Command	○	○	○
0285h	Get Rateset Command	○	○	○
0286h	Get Security Mode Command	○	○	○
0287h	Get WEP Default KeyID Command	○	○	○
0289h	Get Beacon Frame Type Command	○	○	○
028Ah	Get Broadcast SSID Probe Response Command	○	○	○
028Bh	Get Beacon Lost Threshold Command	○	○	○
028Ch	Get Active Zone Command	○	○	○
028Dh	Get SSID Mask Command	○	○	○
028Eh	Get Preamble Type Command	○	○	○
028Fh	Get Authentication Algorithm Command	○	○	○
0290h				
0292h	Get Max Connectable Child Command	○	○	○
0293h	Get Tx Antenna Command	○	○	○
0294h	Get Antenna Diversity Command	○	○	○
0295h	Get Enable Beacon Send/Recv Indication Command	○	○	○
0296h	Get Interference Mode Command	○	○	○
02C0h	Get BSSID Command	○	○	○
02C1h	Get SSID Command	○	○	○
02C2h	Get Beacon Period Command	○	○	○
02C3h	Get DTIM Period Command	○	○	○
02C4h				

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Code	Name	IDLE	CLA SS1	CLA SS3
02C5h	Get GameInfo Command	○	○	○
02C6h	Get Vblank_TSF Command	○	○	○
02C7h	Get Allow/Deny MAC Address List Command	○	○	○
02C8h	Get RTS Threshold Command	○	○	○
02C9h	Get Fragmentation Threshold Command	○	○	○
02CAh				
02CBh	Get EEROM Content Command	○	○	○
02CCh	Get RSSI and Rate Info Command	○	○	○
02CDh	Get TX Power Command			○
02CEh	Get Multicast Rate Command	○	○	○
0301h				
0302h	IDLE Command	○	○	○
0303h	CLASS1 Command	○		
0304h	Restart Command	○	○	○
0305h	Wireless Counter Clear Command	○	○	○
0306h	Get Version Command	○	○	○
0307h	Get Wireless Counters Command	○	○	○
0308h	Get Station State Command	○	○	○
0309h	Test Signal Command	○		

4-3. Wireless Init Example

Each mode's start sequence flow is shown as follows

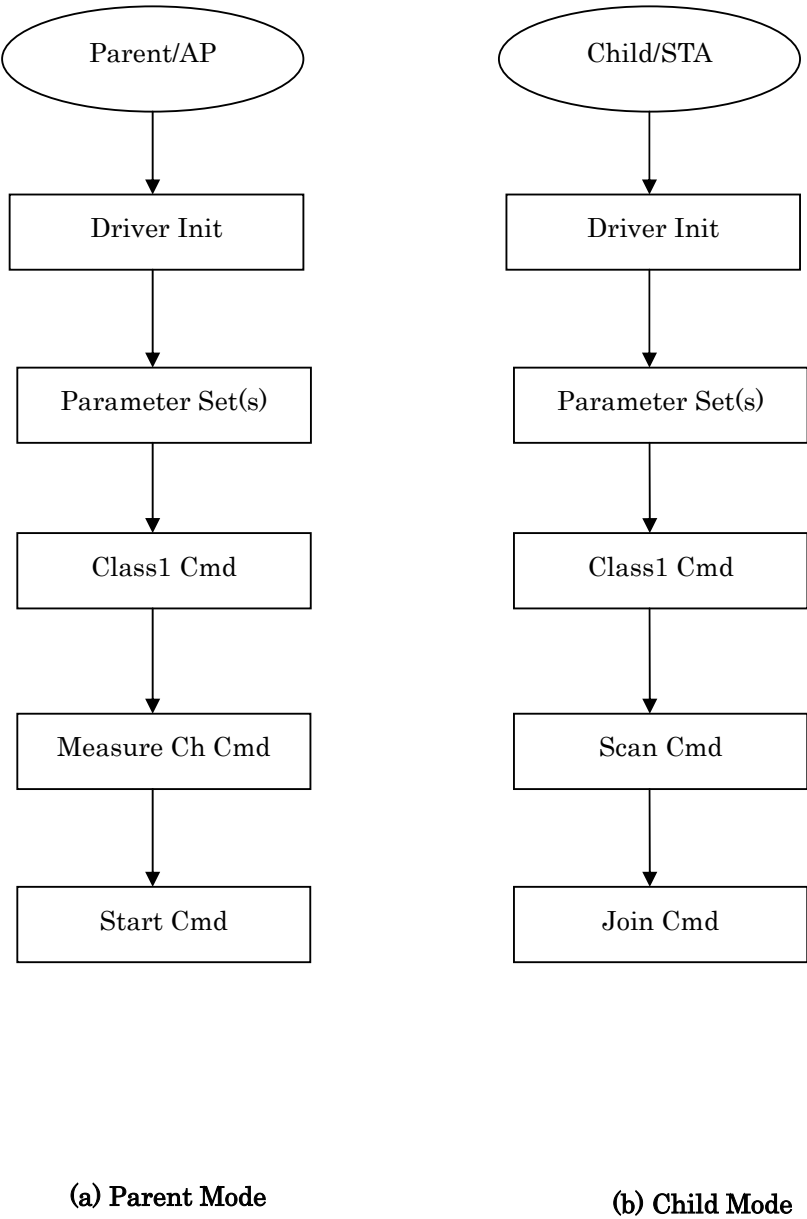


Figure 4-1 Init Example for Each Mode

4-4. SSID & SSID Mask

SSID Element (includes Beacon, Probe Request, Probe Response frame) format is shown as follows:

1 byte	1 byte	0-32 bytes
Element ID (00h)	Length	SSID

Parent's SSID set by MLME-Start.Request.

The parent will perform SSID matching test with Probe Request and (Re)Association Request sent from child. Also, child will perform SSID matching testing when "Scan and Join and receiving beacon".

The bits of the SSID mask are interpreted as follows:

1 – don't care

0 – use as part of the match

4-5. GameInfo Element

GameInfo Element is included in transmit Beacon frames in parent mode. GameInfo Element format is shown as follows:

1 byte	1 byte	3 bytes	1 byte	2 bytes	2 bytes	0-128 bytes
ElementID (DDh)	Length	OUI (00h-09h-BFh)	SubType (00h)	ActiveZone	VBlankTSF	Game Info

The ElementID and OUI, SubType is an ID showing that this Element is a GameInfo Element.

Length: length of element starting with OUI, in bytes. (i.e. Game Info + 8 bytes)

ActiveZone: this is the value set by the [ID: 0x020Ch] Set Active Zone Command.

VBlankTSF : a 16 bit value written by WD.

VBlankTSF will be written by WD using the Set VBlank_TSF command. It will be forwarded to the child as part of the received beacon indication [ID: 08Dh].

GameInfo is set by GameInfo that is in MLME-Start.Request. Also, it is possible to change GameInfo by using Set GameInfo Command.

Child is able to get allocated latest GameInfo by using Get GameInfo Command.

5. Command Details

5-1. Format

The following shows the data format being used by each command. Request area shows command request, Confirm area shows the command execution results. The beginning of the request area is 4 byte aligned.

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	Group ID								Sub Command ID							
	7	Length (n-8)															
	8	Parameters															
	:	:															
	n-1	:															
Confirm	n	Group ID								Sub Command ID							
	n+1	Length (m- (n + 2))															
	n+2	Result Sts Code															
	n+3	Parameters															
	:	:															
	m-1	:															

Field Descriptions:

Note: all lengths are counts of 16 bit words except where expressly declared otherwise

Request area:

Reserved:

Group ID:

Sub Command ID: Group ID and Sub Command ID are combined to form Command ID.

Length: in 16 bit words that indicates Parameter size within Request area

Parameters: Request parameters, variable length

Confirm Area:

Group ID:

Sub Command ID: Group ID and Sub Command ID are combined to form Command ID.

This Command ID must be matched with Request Command ID.

Length: Word count that indicates Parameter size within Confirm area

Result Sts Code: command execution result

Parameters: command execution result's parameters.

5-2. MLME-REQUEST Command Detail

5-2-1. [ID: 0000h] MLME-Reset.Request

Used to reset WL to CLASS1 state.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0000h															
	7	1															
	8	Set Default MIB															
Confirm	9	0000h															
	10	1															
	11	Result Sts Code															

Request area description:

SetDefaultMIB:

Sets MIB parameter operation after reset

1: after reset, clear wireless counters

0: after reset, do not clear wireless counters

Effects:

Take wl driver to CLASS1 state,

drop associations and authentications,

discard any queued or buffered frames

Conditionally clear wireless counters.

Clear SSID.

All other parameters persist across a reset.

Confirm area description:

Result Sts Code:

Indicates result status code. Refer to Table 3-1 for details.

5-2-2. [ID: 0002h] MLME-Scan.Request

Used by station to scan for available BSS.

This command will NOT set SSID or BSSID for the child/STA. These values will be used for the scan but nowhere else.

This command works in the following modes:

infrastructure sta,

IBSS sta

Nitro child

This command scans according to the supplied parameters. The results of the scanning will be sent asynchronously via the MLME-Scan.Indication (ID: 0082h).

The completion time for this command may be estimated as (# of channels in Channel List) * (Max Channel Time).

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0002h															
	7	23															
	8-10	BSSID															
	11	SSID Length															
	12-27	SSID															
	28	ScanType															
	29	Channel Vector															
	30	Max Channel Time															
Conf rm	31	0002h															
	32	1															
	33	Result Sts Code															

Request area description:

Scan is only supported in STA/child modes.

BSSID: Set the scanning BSS's BSSID. If it is set to broadcast address, all BSSID are scanned

SSID Length: Set the scanning BSS's SSID text length. If text length is set to 0, it becomes broadcast SSID.

SSID: Set the scanning BSS's SSID text.

Scan Type: Set the scan method

0: Active Scan

1: Passive Scan

Channel Vector:

Channels to be measured. This is a bit vector organized as follows:

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	rsv	14	13	12	11	10	9	8	7	6	5	4	3	2	1	rsv

Setting a bit to “1” means the corresponding channel will be used in the scan. Bits 0,15 are reserved and should be set to “0”.

Max Channel Time: (10-1000): Set the scanning channel maximum time (unit is ms)

Confirm area description:

Result Sts Code: indicates result status code. Refer to Table 3-1 for details. A SUCCESS value only indicates the Scan request has been accepted for execution. It does NOT provide any information about the scan results.

5-2-3. [ID: 0003h] MLME-Join.Request

Used by child/STA to join BSS.

Upon success the child/STA will be in CLASS3 state.

Upon failure the child/STA will return to CLASS1 state.

If the association has not succeeded after 300 milliseconds the join request is aborted and the child/STA is returned to CLASS1 state.

When this request completes the Join.Indication (ID:0083h) will be sent.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0003h															
	7	Length															
	8	Reserved															
	9	Reserved															
	10-40	BSSDescription															
Conf rm	41	0003h															
	42	1															
	43	Result Sts Code															

Request area description:

Length: 33 + Info Element Length

Reserved: system reserved

BSSDescription: Description of the BSS to be joined.

Each field is described as follows:

Word	
0	BSSDescription Length
1	RSSI
2-4	BSSID
5	SSID Length
6-21	SSID
22	CapaInfo
23	Basic Rate Set
24	Support Rate Set
25	Beacon Period
26	DTIM Period
27	Current Channel
28	CFP Period
29	CFP Max Duration
30	Info Element Length
31-n	Info Element(s)

BSSDescription Length: shows BSSDescription entire length in word unit. This length also includes BSSDescription Length field

RSSI: shows received Beacon or Probe Response signal strength.

BSSID: shows parent's MAC address

SSID Length: shows SSID text length

SSID: shows SSID text

CapaInfo: shows BSS characteristics

Bit	Description
0	BSS Type :
1	01 – ESS, 10 – IBSS
2	CF-Pollable
3	CF-Poll Request
4	Privacy : 1 – All data frames encrypted
5	Short Preamble : 1 – short preamble supported
6	PBCC
7	Channel Agility
8	Reserved
9	Reserved
10	Short Slot Time
11	Reserved
12	Reserved
13	DSSS-OFDM
14	Reserved
15	Reserved

Note:

-- Short Slot Time is not supported. Bit 10 shall always be zero.

-- DSSS-OFDM is not supported. Bit 13 shall always be zero.

Basic Rate Set:

Shows this BSS basic rate. When bit is 1, that particular rate becomes basic rate

Bit	Description
0	1Mbps
1	2Mbps
2	5.5Mbps
3	6Mbps
4	9Mbps
5	11Mbps
6	12Mbps
7	18Mbps
8	24Mbps
9	36Mbps
10	48Mbps
11	54Mbps
12-15	Reserved

Support Rate Set:

Shows this BSS supported rateset. Data structure is the same as the Basic Rate Set. A bit setting of “1” indicates that particular rate is supported

Beacon Period: shows Beacon period (milliseconds)

DTIM Period: shows DTIM period (number of beacons)

Current Channel: shows current channel

CFP Period: shows the number of DTIM during CFP

CFP Max Duration: shows CFP maximum duration (milliseconds). If CP only, then it is 0.

GameInfo Length: shows GameInfo length in byte unit. For MLME-Join.Request, set to 0.

Other Element Count: Shows the number of element that is stored after GameInfo. For MLME-Join.Request, set to 0.

GameInfo/OtherElement: Shows game information when GameInfo Length is not 0. Shows

other Element information when Other Element Count is not 0. When both GameInfo

Length, Other Element Count is 0, this field is not necessary.

Other Element stores all information that has Element 6 bigger than the Element ID of

Beacon and Probe Response during Scan. Element ID unit is byte aligned.

Element ID: 1 byte in length. Shows Element ID.

Element Length: (1 byte in length). Element Body's length is shown in byte unit.

Element Body: Shows Element content.

Confirm Area description:

Result Sts Code: Shows result status code. Refer to Table 3-1 for details.

Note: a SUCCESS value only indicates the request has been accepted for execution .It does not give any information about the success or failure of the join operation.

Notes:

-1-

Only the SSID field is considered when trying to execute this command. All others are ignored.

The desired mode (nitro child, infrastructure sta, IBSS sta) must be selected before calling this command.

-2-

An infrastructure sta will attempt to join the specified SSID. If successful an indication will be issued otherwise it will return to CLASS1 state and do nothing more.

-3-

An IBSS sta will attempt to join the specified SSID. If successful an indication will be issued. If the join fails the IBSS sta will create an ad hoc BSS with the given SSID.

5-2-4. [ID: 0008h] MLME-DisAssociate.Request

Terminate an association. Valid for both AP and STA.

Consequences:

STA: disassociate from AP and return to CLASS1 state

AP: remove specified STA from list of associations

Any buffered frames destined for the [disassociated] address will be dropped. Any frames subsequently sent to the [disassociated] address will be silently dropped.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0008h															
	7	4															
	8-10	Peer Station MAC Address															
	11	Reason Code															
Confirm	12	0008h															
	13	1															
	14	Result Sts Code															

Request area description:

Peer Station MAC Address: identifies the peer from which to disassociate. If the MAC address does not match the associated peer no action is taken and an error is returned.

Reason Code: shows the reason of disassociation. Refer to Table 3-2.

Confirm area description:

Result Sts Code: shows result status code. Refers to Table 3-1.

NOTE:

The peer station MAC address and reason code are ignored when this command is issued to a STA.

A STA disassociating with this command will always issue reason code = 8.

(RSN_DISASSOC_LEAVING)

When an AP disassociates or deauthorizes a STA, that STA will issue a MLME_Disassociate indication (088h) and attempt to rejoin the BSS of the AP that disassociated it. The STA's management software may, upon receipt of the Disassociate indication, take explicit action to prevent the rejoining.

5-2-5. [ID: 0009h] MLME-Start.Request

Used by parent/AP to start the new BSS.

This command moves the parent/AP to CLASS3 state.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0009h															
	7	$23+(n+1)/2$															
	8	SSID Length															
	9-24	SSID															
	25	Beacon Period															
	26	DTIM Period															
	27	Channel															
	28	Basic Rate Set															
	29	Support Rate Set															
	30	GameInfo Length (n)															
	31-	GameInfo															
Confirm	31+ (n+1)/2	0009h															
	32+ (n+1)/2	1															
	33+ (n+1)/2	Result Sts Code															

Request area description

SSID Length: set SSID text length

SSID: set the SSID text.

Beacon Period: set beacon period (ms)

DTIM Period: set DTIM period (number of Beacon). When it's set to 1, all TBTT becomes DTIM.

Channel: set communication channel. The allowable channels are different depends on the Country setting. For the allowable channels that can be set by Domain, refer to Set Country Command.

Basic Rate Set: shows BSS basic rate. When bit is 1, the set rate becomes the basic rate.

Bit	Description
0	1Mbps
1	2Mbps
2	5.5Mbps
3	6Mbps
4	9Mbps

5	11Mbps
6	12Mbps
7	18Mbps
8	24Mbps
9	36Mbps
10	48Mbps
11	54Mbps
12-15	Reserved

Support Rate Set: shows the rate that is support by this BSS. Same structure as Basic Rateset.

GameInfo Length: 0-128: GameInfo length is shown in byte unit.

GameInfo: shows game information. When GameInfo Length is 0, this field is unnecessary.

Confirm area description:

Result Sts Code: shows result status code. Refer to Table 3-1.

5-2-6. [ID: 000Ah] MLME-Measure_Channel.Request

Used to measure channel usage rate.

Valid for AP/parent only.

The results of this command will be returned in the MLME-Measure_Channel Complete Indication (ID: 08Ah).

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	000Ah															
	7	5															
	8	Reserved															
	9	Test Mode															
	10	Reserved															
	11	Measure Time															
	12	Channel Vector															
Confirm	13	000Ah															
	14	1															
	15	Result Sts Code															

Request area description:

Test Mode:

00h: CCA

01h: RPI

Measure Time: in milliseconds

Channel Vector:

Channels to be measured. This is a bit vector organized as follows:

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	rsv	14	13	12	11	10	9	8	7	6	5	4	3	2	1	rsv

Setting a bit to “1” means the corresponding channel will be used in the scan. Bits 0,15 are reserved and should be set to “0”.

Confirm area description:

Result Sts Code: shows result status code. Refer to Table 3-1.

Note that a status of SUCCESS only indicates the command has been accepted for execution. It does not give any information about the measurement results.

5-2-7. [ID: 0082h] MLME-Scan.Indication

Sent from parent/AP Wireless Library when scan request (ID: 002h) completes.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0082h															
	7	Length															
	8	Result Sts Code															
	9	BSS Description Count(n)															
	10-n	BSS Description List															

Indicate area description:

Length: size of BSS Description List in 2 byte words + 2 (for Result Sts Code and BSS Description Count)

Result Sts Code: indicates result status code. Refer to Table 3-1 for details. The values of all subsequent fields are undefined if this is anything other than SUCCESS.

BSS Description Count: indicates the number of discovered BSS.

BSS Description List: List of discovered BSS's. This has the same structure as the BSS Description field in MLME-Join.Request command.

5-2-8. [ID: 0083h] MLME-Join.Indicate

Sent from child/STA Wireless Library when join completes.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0083h															
	7	4															
	8	Result Sts Code															
	9-11	BSSID															
	12	AID															

Indicate area description:

Result Sts Code: shows result status code. Refer to Table 3-1. Note that following fields are undefined if this is anything other than success.

BSSID: MAC address of associated peer.

AID: association id.

5-2-9. [ID: 0086h] MLME-Associate.Indicate

Sent from parent/AP Wireless Library when association is established with child.
Indicates Child/STA has entered CLASS3 state.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0086h															
	7	21															
	8-10	Peer Station MAC Address															
	11	AID															
	12	SSID Length															
	13-28	SSID															

Indicate area description:

Peer Station MAC Address: shows the associated (association is established) child MAC address.
AID: shows the allocated Association ID (AID) value by child with established association.
SSID Length: shows the SSID length sent from child when it was requesting association.
SSID: shows the SSID sent from child when it was requesting association.

5-2-10. [ID: 0088h] MLME-Disassociate.Indicate

Sent from Parent/AP and Child/STA Wireless Library when disassociated.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	5	0088h															
	7	4															
	8-10	Peer Station MAC Address															
	11	Reason Code															

Indicate area description:

Peer Station MAC Address: shows the destination’s Station (Parent or Child) MAC address.

Reason Code: shows the reasons of disassociation. See Table 3-2.

5-2-11. [ID: 008Ah] Measure_Channel.Indication

Valid for AP/parent only.

Sent from AP/parent wireless library when Measure_Channel.Request completes.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	5	008Ah															
	7	Length															
	8	Result Sts Code															
	9	Measure Type															
	10	Channel Vector															
	10-n	Measure Results															

Length: (in 2 byte words)

CCA: 3 + 16

RPI: 3 + 128

Result Sts Code: shows result status code. Refer to Table 3-1. Note that following fields are undefined if this is anything other than success.

Measure Type: 0 – CCA, 1 – RPI

Channel Vector: a bit vector, each bit corresponds to a channel. For example bit 1 corresponds to channel 1, bit 5 corresponds to channel 5, etc. If a bit is set it means that channel participated in the measurement hence the array contents are valid for that index in Measure Results (below). Note that bits 0 and 15 do not correspond to a valid channel. The array contents for the corresponding indices have no meaning.

Measure Results:

For CCA:

An array of uint16, the index of each uint16 corresponds to a channel number, the value of the indexed uint16 corresponds to the measured value. The values for Indices 0 and 15 are reserved, these values have no meaning. Indices 1-14 correspond to channels 1-14 respectively.

uint16 cca_results[16]

cca_results[0] and cca_results[15] are reserved.

cca_results[1] through cca_results[14] correspond to the measured cca values for channels 1 through 14 respectively.

For RPI:

Sixteen arrays of 8 uint16:

uint16 rpi_results[16][8]

rpi_results[0][] and rpi_results[15][] are reserved. The values in these arrays have no meaning.

rpi_results[1][] through rpi_results[14][] correspond to 8 uint16 arrays of measurement results for channels 1 through 14 respectively.

For each array:

Index	Power level (dBm)
0	pwr <= -87
1	-87 <= pwr <= -82
2	-82 <= pwr <= -77
3	-77 <= pwr <= -72
4	-72 <= pwr <= -67
5	-67 <= pwr <= -62
6	-62 <= pwr <= -57
7	-57 <= pwr

5-2-12. [ID: 008Bh] MLME-Beacon_Lost.Indication

When the number of consecutive beacons missed exceeds the value of the Beacon Lost threshold, this indication will be sent from Wireless Library. This only happens for child/STA modes.

XXX: should this occur in IBSS (ad hoc) mode?

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	008Bh															
	7	3															
	8-10	Peer Station MAC Address															

Indicate area description:

Peer Station MAC Address: shows connection destination MAC address.

5-2-13. [ID: 008Ch] MLME-Beacon_Send.Indication

This message occurs when Beacon frame is sent. This message indication can be enabled/disabled by Set Beacon Recv/Send Indication command. This message only happens in parent/AP mode.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	008Ch															
	7	0															

5-2-14. [ID: 008Dh] MLME-Beacon_Recv.Indication

This message is sent when Beacon frame is received from associated AP.

This message indication can be enabled/disabled by Set Beacon Recv/Send Indication command. This is only sent in child/STA modes.

XXX: IBSS mode?

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	008Dh															
	7	20+(n+1)/2															
	8-10	Reserved															
	11	GameInfo Length (n)															
	12-14	Reserved															
	15	Rate															
	16	RSSI															
	17-20	Reserved															
	21-23	Reserved															
	24-26	Source MAC Adrs															
	27	VBlank_TSF															
	28-n	GameInfo															

Indicate area description:

GameInfoLength: shows GameInfo data in byte unit.

RSSI: shows received Beacon frame's RSSI.

Rate: shows received Beacon frame's receiving rate

Source MAC Address: shows Beacon frame's source MAC address.

VBlank_TSF: contains received VBlank_TSF

GameInfo: stores the GameInfo data that is included in Beacon frame.

5-3. MA-REQUEST Details

5-3-1. [ID: 0100h] MA-Data.Request

Send data frames from Wireless Manager to Wireless Library.

No confirmation will be returned from this request. If the frame cannot be queued an error indication will be generated.

Requirements:

-There must be NWM_PKT_HDROOM bytes of headroom on buffers submitted for transmission. NWM_PKT_HDROOM is defined in the nintendowm.h file. If the required headroom is not present additional buffer allocations and copies will be done internally. This will reduce throughput.

- This command will handle DIX Ethernet frames and 802.3 frames with SNAP headers.

This command is exclusively for wifi. Nitro requests MUST use (poll, key, etc)

- All frames must have even number of bytes. Odd byte count frames will be null padded at end.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0100h															
	7	Length															
	8	Frame Id															
	9-11	Dest Mac Addr															
	12-14	Src Mac Addr															
	15	Data															
	n	...															

NO CONFIRMATION WILL BE RETURNED. WD must discontinue use of the request buffer when issuing this command.

NOTE:

-1- Per Nintendo's request, Reserved areas have been deleted.

-2- Confirm portion is irrelevant (because no response will be issued) hence has been deleted.

-3- If WL cannot queue this frame for transmission an error indication will be generated. The indication will at least contain the Frame ID (below) to allow WD to identify the frame which could not be queued.

Frame ID: unique ID assigned by WD. Not used by WL.

Frame Length: length of request after this field in 16 bit words

Reserved: not used by WL

Destination MAC Adrs: shows destination MAC address.

Source MAC Adrs: shows source MAC address.

Data: TX data.

NOTE:

The source MAC address plus the Destination MAC address plus the Tx data form a contiguous Ethernet frame, either DIX or 802.3. This means the first bytes of the data are either:

- the ethertype (DIX frame)
- the 802.3 length et al

5-3-2. [ID: 0101h] MA-KeyData.Request

Used to send Key data to Wireless Library.

Notes:

There must be N bytes of headroom on buffers submitted for transmission. N is TBD.

No confirmation will be returned from this request. If the frame cannot be queued an error indication will be generated.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0101h															
	7	Length															
	8	Frame ID															
	9	Reserved															
	10	KeyData Length															
	11	WDHeader															
	12-n	KeyData															

Request area description:

Length: length of request in 2 byte words.

KeyData Length: (0-516): shows the length (byte unit) of data in KeyData . It does not include WDHeader.

WDHeader: This is the first two bytes of the outgoing data packet.

KeyData: Tx key data based on MP sequence.

Frame ID: a unique identifier assigned by WD. It is not used by WL.

Note:

-1- No response will be returned. WD must discontinue use of the Request buffer when issuing this command.

-2- Confirm portion has been removed because no response will be issued.

-3- If WL is unable to queue this frame for transmission an error indication will be generated. This indication will contain at least the Frame ID (above) to allow WD to identify the frame which could not be queued.

5-3-3. [ID: 0102h] MA-MP.Request

Used to start MP(Multi-Poll) sequence. This command is only for parent.

Notes:

Data for this request is neither interpreted nor modified.

There must be N bytes of headroom on buffers submitted for transmission. N is TBD.

No confirmation will be returned from this request. If the frame cannot be queued an error indication will be generated.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0102h															
	7	Length															
	8	FrameID															
	9	Reserved															
	10	Resume															
	11	RetryLimit															
	12	TXOP															
	13	PollBitmap															
	14	TMPTT															
	15	Current TSF															
	16	Data Length (n)															
	16	WDHeader															
	17-n	Data															

NOTES:

-1- No confirm area in packet since no confirm will be issued.

-2- WD must discontinue use of the request buffer after issuing this command. We do NOT return a response.

-3- If WL cannot queue this frame for transmission an error indication will be generated. This indication will contain at least the Frame ID (below) to assist WD in identifying the frame which could not be queued.

Request area description:

Frame ID: a unique identifier assigned by WD. It is not used by WL.

Length: length of frame in 2 byte words after this field.

Resume:

Set the MP Resume function. The following shows the details on Resume field. When

Resume function is enabled, each field can be changed. Fields that are not needed to change, the unspecified values do not create any problem. RetryLimit, Current TSF fields are mandatory when Resume function is enabled.

Bit	Description
0	Reserved
1	TXOP change selector 1: when Resume is enabled, TXOP field becomes valid. 0: when Resume is enabled, use the same TXOP as the previous MP
2	PollBitmap change selector 1: when Resume is enabled, PollBitmap field becomes valid. 0: when Resume is enabled, give the Poll only by child that has no response in the previous MP
3	TMPTT change selector 1: when Resume is enabled, TMPTT field becomes valid. 0: when Resume is enabled, use the same TMPTT as the previous MP
4	Data change selector 1: when Resume is enabled, Data Length and Data become valid. 0: when Resume is enabled, use the same data as the previous MP
5-14	Reserved. Please set to 0.
15	Resume enable/disable selector 1: Resume is enabled. 0: execute new MP

RetryLimit: (0-256)

Set the MP frame maximum retry. When 0, no retry. For retry up to TMPTT, please set to 256.

TXOP:

Set the allowable transmission time to child by data size or time (us). The following shows the details on TXOP field.

Bit	Description
0-14	<p>When Bit15 is 0, child allowable transmission data size (wireless header and FCS are not included) is set to byte unit. As for WL, MP frame TXOP is calculated from this value.</p> <p>When Bit15 is 1, setting timing is set directly to MP frame TXOP. This time is for Wireless frame's Preamble, header, frameBody, FCS required transmission time that is displayed in (us) units. TXOP formula is as follows: $96+(24+n+4)*4$ [us], where n is the FrameBody byte number.</p> <p>Note) In the case of byte setting due to hardware bug, TXOP is added 6us. Duration is added 6us for each Poll child. In the case on time setting, TXOP and Duration cannot be adjusted (compensated).</p>
15	<p>Time/data size setting selector 1: Time 0: data size</p>

For the child actual transmission data size, WDHeader 2 bytes value is added to MA-KeyData.req's KeyData Length. For TXOP, it must also consider WDHeader portion and set accordingly.

PollBitmap:

Set the Poll allocated child. The following shows the details on PollBitmap. Poll allocated child's AID is indicated by the corresponding bit of 1

Bit	Description
0	Reserved. Please set to 0.
1	1: AID is allocated Poll to child 1 0: AID is not allocated Poll to child 1
2	1: AID is allocated Poll to child 2 0: AID is not allocated Poll to child 2
3	1: AID is allocated Poll to child 3 0: AID is not allocated Poll to child 3
4	1: AID is allocated Poll to child 4 0: AID is not allocated Poll to child 4
5	1: AID is allocated Poll to child 5 0: AID is not allocated Poll to child 5
6	1: AID is allocated Poll to child 6 0: AID is not allocated Poll to child 6
7	1: AID is allocated Poll to child 7 0: AID is not allocated Poll to child 7
8	1: AID is allocated Poll to child 8 0: AID is not allocated Poll to child 8
9	1: AID is allocated Poll to child 9 0: AID is not allocated Poll to child 9
10	1: AID is allocated Poll to child 10 0: AID is not allocated Poll to child 10

11	1: AID is allocated Poll to child 11 0: AID is not allocated Poll to child 11
12	1: AID is allocated Poll to child 12 0: AID is not allocated Poll to child 12
13	1: AID is allocated Poll to child 13 0: AID is not allocated Poll to child 13
14	1: AID is allocated Poll to child 14 0: AID is not allocated Poll to child 14
15	1: AID is allocated Poll to child 15 0: AID is not allocated Poll to child 15

TMPTT:

Time in (10 microsecond units) for MP sequence to complete. This value is:

DIFS + maximum backoff time + MP frame time + child response time + MPACK frame time.

XXX: Where does this value (Current TSF) come from? We recommend not using Current TSF. Instead, compute TMPT as if Current TSF is zero

Current TSF:

Set the current TSF time's lower 16bits value. WL will treat this time as the moment when MA-MP.Request is issued. Then WL will re-calculate TMPTT in MP frame transmission.

Data Length: (0-516)

Set the Data length to byte unit. WDHeader length is not included.

WDHeader:

Set the appended data to MP frame data header.

Data:

MP frame data. When Data Length is 0 and when setting the Data Resume, this field is ignored.

5-4. MA-INDICATE Details

5-4-1. [ID: 0180h] MA-Data.Indicate

Sent when Wireless Library receives a data frame.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0180h															
	7	Length															
	8	Pad															
	9-n	Received Frame															

Reserved: Currently unused

Length: Shows the data field length in byte unit. Odd length frames will be null padded so that the length is always an even number of bytes.

Pad: Used for internal alignment purposes

Received Frame: the reconstructed Ethernet frame beginning with the first byte of the destination MAC address.

5-4-2. [ID: 0182h] MA-MP.Indication

Sent only in child mode as response to MA-MP.Request

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0182h															
	7	n-7															
	8-n	RxMpFrame															

RxMpFrame:

Stores MP receive frame. Receive frame format is as follows:

Word	15-8	7-0
0-2	Reserved	
3	Length	
4	KeyTxSts	
5	MPACK TimeStamp	
6	TimeStamp	
7	RSSI	Rate
8-11	Reserved	
12-14	Destination MAC Adrs	
15-17	Source MAC Adrs	
18-20	Reserved	
21	Sequence Number	
22	TXOP	
23	PollBitmap	
24-	Data	

Reserved:

WL uses this reserved area.

Length:

Shows Data field length in byte unit

KeyTxSts:

Shows status that is related to MP sequence.

Bit	15	14	13	12	11	10-0
Description	rsv	ResKey	PolledMP	rsv	rsv	rsv

ResKey: When 1, it shows that there is KeyData response to this MP. When 0, it shows that there is NullKey response. This value is only valid when PolledMP=1.

PolledMP: When 1, it shows that it's being Polled by this MP.

TimeStamp:

It stores the "TSF time when it finished receiving the current frame" into the "lower 16bit after

being 4-bits-right-shifted". Depends on the delay due to interrupt processing, the stored value could be a delayed value than the actual time.

RSSI:

Shows the current frame's receive signal strength

Rate:

Shows RX rate. When 1Mbps, it is 0x0a, when 2Mbps, it is 0x14.

NOTE: Rate and RSSI for Nitro frames are included in the moving averages maintained by the driver and available from individual Nitro frames as well.

Destination MAC Adrs:

Shows destination MAC address. MP frame's MAC address is (03-09-BF-00-00-00).

Source MAC Adrs:

Shows source MAC address. It's parent's address.

Sequence Number:

Shows the received Sequence Number.

TXOP

Shows TXOP of received MP frame

PollBitmap

Shows Bitmap of received MP frame

Data:

Set RX data. When Length is 0, this field does not exist.

5-4-3. [ID: 0184h] MA-MPEND.Indication

When MP sequence is finished, it is sent from Wireless Library. Sent only by parent.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0184h															
	7	n-7															
	8-n	MpEndData															

Request area description:

MpEndData:

Stores the collected KeyData during MP sequence. Data format is as follows:

Word	15-0
0	PollBitmap
1	Current TSF
2	Data Count
3	Length
4	Tx Count
5-	Data[n]

PollBitmap:

Shows the PollBitmap value when the final MP sequence is finished. When there is no response from the child that the Poll sent to, that child's corresponding AID bit is set to "1".

Current TSF:

This field contains bits 6-21 of the TSF counter value when the indication is sent up.

Data Count:

Shows the number of data field

Length:

Shows one Data byte count

Tx Count:

Shows the number of TX MP.

Data:

This Data field only contains Data Count number. It collects all the received data from each child. The data format is as follows:

Word	15-8	7-0
0	Length	

1	RSSI	Rate
2	AID	
3	Reserved	
4-	Data	

Length:

Shows the data field enabled length in byte unit. When KeyData is not able to be obtained, it shows 0xFFFF.

RSSI:

Shows this data's receiving signal strength.

Rate:

Shows RX rate. When 1Mbps, it is 0x0a, when 2Mbps, it is 0x14

AID:

Shows destination AID

Data:

Shows received data

5-4-4. [ID: 0185h] MA-MPACK.Indication

Message is sent only in child mode.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0185h															
	7	24															
	8-31	RxMpAckFrame															

Request area description:

RxMpAckFrame:

Stores MPACK received frame. Receive frame format is as follows:

Word	15-8	7-0
0-2	Reserved	
3	Length	
4	KeyTxSts	
5	Reserved	
6	TimeStamp	
7	RSSI	Rate
8-11	Reserved	
12-14	Destination MAC Adrs	
15-17	Source MAC Adrs	
18-20	Reserved	
21	Sequence Number	
22	TMPTT	
23	PollBitmap	

Reserved:

WL uses this reserved area.

Length:

Always 0.

KeyTxSts:

Shows status that is related to MP sequence.

Bit	15	14	13	12	11	10-0
Description	rsv	ResKey	PolledMP	rsv	rsv	rsv

ResKey:

When 1, it shows that there is KeyData response to this MP. When 0, it shows that there is

NullKey response. This value is only valid when PolledMP=1.

PolledMP:

When 1, it shows that it's being Polled by previous MP frame.

TimeStamp:

It stores the "TSF timer when it finished receiving the MPACK frame" into the "lower 16bit after being 4-bits-right-shifted". Depends on the delay due to interrupt processing, the stored value could be a delayed value than the actual time.

RSSI:

Shows the current frame's receive signal strength

Rate:

Shows RX rate. When 1Mbps, it is 0x0a, when 2Mbps, it is 0x14.

Destination MAC Adrs:

Shows destination MAC address. MP frame's MAC address is (03-09-BF-00-00-10).

Source MAC Adrs:

Shows source MAC address. It's parent's address.

Sequence Number:

Shows the received Sequence Number.

TXOP

Shows TXOP of received MPACK frame

PollBitmap

Shows Bitmap of received MPACK frame

5-4-5. [ID: 0186h] MA-Fatal_Err.Indication

This message is issued when fatal errors occur during operation.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0186h															
	7	Length															
	8	ErrCode															
	9-n	Error Specific Data															

Request area description:

Length:

Length of indication in 16 bit words starting at word offset 8.

ErrCode:

TX PKT ENQUEUE ERROR:	0
KEY DATA REQUEST FAILURE	1
MP REQUEST FAILURE	2

Error Specific Data:

Error Specific Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data	0	frameid															
	1	Failure code															

frameid (from frame submitted)

failcode (specific failure reason, see Table 3-1)

5-4-6. [ID: 0187h] MA-Time_Out.Indication

This message is issued when specific timeouts occur during operation.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0187h															
	7	Length															
	8	IndCode															
	9-n	Indication Specific Data															

Request area description:

Length:

Length of indication in 16 bit words starting at offset 8.

IndCode:

Values correspond to specific timeouts

0 – MPACK timeout.

Others TBD.

Indication Specific Data:

Each Indication code may define data to return in this field.

XXX: need specific definitions of what is returned for each indication type.

5-4-7. [ID: 0190h] MA-Channel_Use.Indication

This message is issued when the wireless driver commences or ceases use of a channel.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0190h															
	7	2															
	8	Channel Number															
	9	ON_OFF															

Channel Number: identifier of channel

ON_OFF:

- 0 – wireless driver has ceased using <Channel Number>
- 1 – wireless driver is using <Channel Number>

The purpose of this indication is to inform upper layers that the wireless driver has commenced using or ceased using a particular channel.

This indication will be issued under the following conditions:

Transition to CLASS3 state (ON_OFF = 1)

- STA completes association (Join cmd, 003h followed by Join Complete Indication, 0083h)
- AP or IBSS STA starts a BSS (Start cmd, 009h)

Transition from CLASS3 state to IDLE or CLASS1 state (ON_OFF = 0)

- issuing reset (000h) or restart (304h) commands in CLASS3 state
- STA is deauthenticated or disassociated

This indication will NOT be issued during scans of channels.

5-4-8. [ID: 0191h] MA-IAPP.Indication

This message is issued to convey IAPP frames to WD. WD should strip the indication header and forward the IAPP frame to its Ethernet port.

Packet Data:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Indicate	0-5	Reserved															
	6	0191h															
	7	Length															
	8-n	Indication Frame															

Length: length of Indication Frame in 16 bit words + 1 (for pad)

Pad: used for internal alignment purposes

Indication Frame: an IAPP message to be forwarded onto an Ethernet network.

5-5. Parameter Setting Commands

5-5-1. [ID: 0200h] Set All Parameter Command

Station Mac Address, Short Retry Limit, Enable Channel, Operation Mode settings, et al.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0200h															
	7	72															
	8-10	Reserved															
	11	Short Retry Limit															
	12	Reserved															
	13	Reserved															
	14	Operation Mode															
	15	Reserved															
	16	Security Mode															
	17	WEP Default KeyID															
	18-27	WEP Key 0															
	28-37	WEP Key 1															
	38-47	WEP Key 2															
	48-57	WEP Key 3															
	58	Beacon Frame Type															
	59	Broadcast SSID Probe Request Response															
	60	Beacon Lost Threshold															
	61	Reserved															
	62-77	SSID Mask															
	78	Preamble Type															
	79	Authentication Algorithm															
	80	Long Retry Limit															
	82	WPA Passphrase Length															
	83-114	WPA Passphrase															
Confirm	115	0200h															
	116	1															
	117	Result Sts Code															

Request area description: For field, refer to each individual command.

Confirm area description:

Result Sts Code: shows result status code. Refer to Table 3-1.

Notes:

-1- Reserved fields at 8-10, 12 were formerly Mac Address and Enable Channel respectively. Removed per Nintendo request.

5-5-2. [ID: 0201h] Set Mac Address Command

Set Station MAC Address

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0201h															
	7	3															
	8-10	Station MAC Address															
Conf rm	11	0201h															
	12	1															
	13	Result Sts Code															

Request area description:

Station MAC Address: set station’s MAC Address. For testing purposes only.

XXX: testing under what conditions?

Note: Actual device MAC address is stored in non-volatile storage on board wi-fi module. This command will NOT be used to set it.

Confirm area description:

Result Sts Code: shows result status code. Refer to Table 3-1.

5-5-3. [ID: 0202h] Set Retry Limit Command

Set the number of retries for data and management frames.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0202h															
	7	2															
	8	Short Retry Limit															
	9	Long Retry Limit															
Confirm	10	0202h															
	11	1															
	12	Result Sts Code															

Request area description:

Short Retry Limit: 1-255:

Default: 7

Long Retry Limit: 1-255.

Default: 4

Confirm area description:

Result Sts Code: shows result status code. Refer to Table 3-1.

5-5-4. [ID: 0203h] Set Country Command

Set channels that can be used.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0203h															
	7	2															
	8-9	Country Code															
Confirm	9	0203h															
	10	2															
	11	Result Sts Code															
	12	Allowed Channel List															

Request area description:

Country Code: NULL terminated string, up to 3 bytes of country code followed by NULL.

Confirm Area description:

Result Sts Code: Shows result status code. Refer to Table 3-1.

Allowed Channel list: Each channel is mapped as follows. When a bit is 1, the corresponding channel is enabled.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	rsv	14	13	12	11	10	9	8	7	6	5	4	3	2	1	rsv

Note: Refer to separate documentation for channels enabled in particular administrative domains.

5-5-5. [ID: 0204h] Set Operation Mode Command

Set the operation mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0204h															
	7	1															
	8	Operation Mode															
Conf rm	9	0204h															
	10	1															
	11	Result Sts Code															

Request area description:

Operation Mode:

0000h: Invalid, do not use.

0001h: Parent Mode

0002h: Reserved

0003h: STA Infrastructure Mode

0004h: STA Ad hoc mode

0005h: AP mode

0006h: Travel Router

Meanings of modes:

Parent Mode: nitro only

Child Mode: nitro only

STA infrastructure Mode: 802.11 operation only

STA Ad hoc mode: 802.11 IBSS operation only

AP mode: 802.11 operation only

Travel Router: 802.11 operation only

Confirm area description:

Result Sts Code: Shows result status code. Refer to Table 3-1.

NOTE:

If STA Ad hoc mode (004h) is selected and the wireless driver is queried for opmode before a Join or Start command is issued the returned opmode will be incorrectly reported as STA Infrastructure Mode (003h).

5-5-6. [ID: 0205h] Set Rateset Command

Note: this command sets the transmit rate for all unicast data frames. Mgt frames will be sent at the “next lower basic” rate.

Multicast frames have a separate rate set facility. (NOT shown)

There is NO facility for setting control frame rates – note this would be non 802.11 compliant

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0205h															
	7	2															
	8	Supported Rates															
	9	Basic Rates															
Conf rm	10	0205h															
	11	1															
	12	Result Sts Code															

Request Area Description:

Supported Rates:

A bit vector as shown below. Setting a bit means that rate is requested as a rateset member. All rates are supported in 802.11 (wifi) mode. Only 1 and 2 Mbps are supported in nitro mode.

Basic Rates:

A bit vector as shown below. Setting a bit identifies that rate as a basic rate. At least one rate must be specified as basic.

Bit vector definition:

Bit	Description
0	1Mbps
1	2Mbps
2	5.5Mbps
3	6Mbps
4	9Mbps
5	11Mbps
6	12Mbps
7	18Mbps
8	24Mbps
9	36Mbps
10	48Mbps
11	54Mbps
12	Reserved

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-7. [ID: 0206h] Set Security Mode Command

Set the WEP mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0206h															
	7	1															
	8	Security Mode															
Conf rm	9	0206h															
	10	1															
	11	Result Sts Code															

Request Area Description:

Security Mode :

0000h: No encryption (Default)

0001h: WEP RC4 40bit encryption

0002h: WEP RC4 104bit encryption

0003h: Reserved

0004h: WPA-PSK(TKIP) (For STA infrastructure mode only)

0005h: WPA2-PSK(AES) (For STA infrastructure mode only)

0006h: WPA-PSK(AES) (For STA infrastructure mode only)

Note:

The WPA-PSK(AES) setting (security mode = 6) is technically a proprietary extension.

Compatibility with other vendors' (non-Broadcom) AP's cannot be guaranteed.

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-8. [ID: 0207h] Set WEP Default KeyID Command

Sets WEP Default KeyID.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0207h															
	7	1															
	8	WEP Default KeyID															
Confirm	9	0207h															
	10	1															
	11	Result Sts Code															

Request Area Description:

WEP Default KeyID :

00h-03h

Default : 00h

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-9. [ID: 0208h] Set WEP Key Command

Sets WEP Key.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0208h															
	7	40															
	8-17	WEP Key 0															
	18-27	WEP Key 1															
	28-37	WEP Key 2															
	38-47	WEP Key 3															
Confirm	48	0208h															
	49	1															
	50	Result Sts Code															

Request Area Description:

WEP Key 0-3:

Four keys are defined. Each key field is 20 bytes. For 40-bit RC4, use a key length of 5 bytes. For 104-bit RC4, use a key length of 13 bytes. For 128-bit RC4, use a key length of 16 bytes.

Note: 128 bit key length is not supported. Do not use it.

Default: all zeros

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Note: the Security Mode (cmd 0206h) must be set appropriately before issuing this command.

5-5-10. [ID: 0209h] Set Beacon Frame Type Command

Sets Beacon Frame Type.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0209h															
	7	1															
	8	Beacon Frame Type															
Confirm	9	0209h															
	10	1															
	11	Result Sts Code															

Request Area Description:

Beacon Frame Type :

Zero: Standard (Default), include SSID

Non-zero: Do not include SSID

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-11. [ID: 020Ah] Set Broadcast SSID Probe Response Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	020Ah															
	7	1															
	8	Probe Request Response Flag															
Confirm	9	020Ah															
	10	1															
	11	Result Sts Code															

Request Area Description:

Probe Response Flag:

Zero: Respond to Probe Requests with Broadcast SSID (Default)

Non-zero: Do not respond to Probe Requests with Broadcast SSID

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-12. [ID: 020Bh] Set Beacon Lost Threshold Command

Set Beacon Lost Threshold (the number of consecutive lost beacons that will trigger a MLME-Beacon_Lost.Indicate message).

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	020Bh															
	7	1															
	8	Beacon Lost Threshold															
Confirm	9	020Bh															
	10	1															
	11	Result Sts Code															

Request Area Description:

Beacon Lost Threshold: 0-255

Setting 0 disables MLME-Beacon Lost.Indicate messages.

Default: 16

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-13. [ID: 020Ch] Set Active Zone Command

Sets the time for Parent to remain in Active state after TBTT. (In child mode the parent's setting is used to determine ActiveZone.)

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	020Ch															
	7	1															
	8	Active Zone Time(TU)															
Confirm	9	020Ch															
	10	1															
	11	Result Sts Code															

RequestArea Description :

Active Zone Time : (0x000a ~ 0xFFFF)

Sets the time for Parent to remain in Active state after TBTT, in milliseconds. The Child obtains this value from the Parent and performs normal frame exchanges. When the value set is larger than the Beacon Period then always remain in Active state.

Default : 0xFFFF

ConfirmArea Description :

Result Sts Code :

Refer to Table 3-1.

5-5-14. [ID: 020Dh] Set SSID Mask Command

Define the Mask data to be used for SSID matching test. This applies to both nitro and wifi modes.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	020Dh															
	7	16															
	8-23	SSID Mask															
Confirm	24	020Dh															
	25	1															
	26	Result Sts Code															

Request Area Description:

SSID Mask:

Defines the Mask data to be used for SSID matching test. Bits that are set to 1 are *not* checked as part of the SSID matching test.

Default:

0000 0000 0000 0000 0000 0000 0000 0000

0000 0000 0000 0000 0000 0000 0000 0000 (Hex)

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-15. [ID: 020Eh] Set Preamble Type Command

Sets Preamble Type.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	020Eh															
	7	1															
	8	Preamble Type															
Confirm	9	020Eh															
	10	1															
	11	Result Sts Code															

Request Area Description:

Preamble Type:

0: Long Preamble Mode

1: Short Preamble Mode (default)

(Note that 1Mbps frames are always sent with Long Preamble regardless of the setting.)

Note: OFDM preamble is automatically chosen for OFDM rates. It can not be set for CCK rates.

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-16. [ID: 020Fh] Set Authentication Algorithm Command

Set the default Authentication Algorithm for Parent mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	020Fh															
	7	1															
	8	Authentication Algorithm															
Confirm	9	020Fh															
	10	1															
	11	Result Sts Code															

Request Area Description:

Authentication Algorithm:

0: OPEN_SYSTEM (default)

1: SHARED_KEY

When OPEN_SYSTEM is selected, a Child can be authenticated with SHARED_KEY; however, when SHARED_KEY is specified, authentications with OPEN_SYSTEM will be rejected.

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-17. [ID: 0211h] Set Lifetime Command

This command sets frame lifetime

A buffered frame will be discarded if its lifetime expires before the frame transmits.

This command also sets limits for aging out associations. See descriptions below.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0211h															
	7	3															
	8	Check Frequency															
	9	Lifetime															
	10	Frame Life Time															
Confirm	11	0211h															
	12	1															
	13	Result Sts Code															

Request area description:

FrameLifeTime:

Indicate the set frame's LifeTime in milliseconds.

If 0 is indicated, frames are not subject to lifetime function.

Check Frequency: seconds, see below for details

Lifetime: seconds, see below for details

Confirm Area description:

Result Sts Code: Shows result status code. Refer to Table 3-1.

Association aging functions:

AP Mode: Every Check Frequency seconds, if no access from a STA for last Lifetime seconds, send a NULL data frame. If no response, retry two times. If still no response, DisAssociate and send DisAssociate Indication.

MP Parent: At every Check Frequency seconds, if no access from a STA for last Lifetime seconds, DisAssociate and send DisAssociate Indication. (Does NOT send NULL frames.)

STA Mode:

MP Child:

The STA/Child will issue a beacon lost indication when no beacons have been received for the interval specified by the receive beacon lost threshold. This threshold may be set by the Set Beacon Lost Threshold Command (020Bh). WD can then issue a Disassociate request at its discretion.

Note: WD is not required to issue a Disassociate request. If it does not the STA will not be disassociated. It will commence roaming but will continue to accept data frames from the AP.

5-5-18. [ID: 0212h] Set Max Connectable Child Command

Sets the maximum number of Child/STA nodes that can be connected when in Parent/AP mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0212h															
	7	1															
	8	Count															
Confirm	9	0212h															
	10	1															
	11	Result Sts Code															

Request Area Description:

Count:

Specifies the maximum number of Child/STA nodes that can be connected.

Valid values are $0 \leq \text{Count} \leq \text{MAXIMUM}$

The MAXIMUM is 128.

WD is responsible for ensuring the MAXIMUM is appropriate for the operating mode.

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-19. [ID: 0213h] Set Tx Antenna Command

Set the Tx Antenna.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0213h															
	7	1															
	8	Use Antenna															
Confirm	9	0213h															
	10	1															
	11	Result Sts Code															

Request Area Description:

Use Antenna:

- 0: Only use main-antenna
- 1: Only use sub-antenna
- 3: Follow receive antenna usage

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-20. [ID: 0214h] Set Antenna Diversity Command

Set the Antenna Diversity mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0214h															
	7	2															
	8	Diversity Mode															
	9	Use Antenna															
Conf rm	10	0214h															
	11	1															
	12	Result Sts Code															

Request Area Description:

Diversity Mode:

Zero: Diversity off

Non-zero: Diversity on (Default)

Use Antenna:

Specifies which antenna is to be used when Diversity Mode is set to OFF. When Diversity Mode is set to ON, this field is ignored.

0: Only use main-antenna

Non-zero: Only use sub-antenna

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-21. [ID: 0215h] Set Enable Beacon Send/Recv Indication Command

Enable/disable issuance of SendRecv Beacon.Indication messages.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0215h															
	7	2															
	8	Enable Send															
	9	Enable Receive															
Confirm	10	0215h															
	11	1															
	12	Result Sts Code															

Request Area Description:

Enable Send:

Specifies whether to send the Send Beacon Indication.

Zero: Do not send (default)

Non-zero: Send

Enable Receive:

Specifies whether to send the Recv Beacon Indication.

Zero: Do not send (default)

Non-zero: Send

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-22. [ID: 0216h] Set Interference Mode Command

Set the Interference Mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0216h															
	7	1															
	8	Interference Mode															
Confirm	9	0216h															
	10	1															
	11	Result Sts Code															

Request Area Description:

Interference Mode:

- 0: No Interference Mitigation: Use this setting to disable all interference mitigation
- 1: Non Wlan Interference mode: Use this setting to force interference mitigation for noise from non-WLAN sources
- 2: Wlan Interference, no auto detect: Use this setting to force interference mitigation for noise from other WLAN networks
- 3: Wlan Interference, auto detect (default): Use this setting to let the driver determine when to enable WLAN interference mitigation

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-23. [ID: 0242h] Set Beacon Period Command

Set beacon period in TU. Valid only for parent/AP modes.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0242h															
	7	1															
	8	Beacon Period															
Confirm	9	0242h															
	10	1															
	11	Result Sts Code															

Request Area Description:

Beacon Period : 10-1000 TU

Default: 16

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-24. [ID: 0243h] Set DTIM Period Command

Sets DTIM Period (number of Beacons) for the BSS. This command forces a change in the DTIM period. Only valid in Parent mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0243h															
	7	1															
	8	DTIM Period															
Confirm	9	0243h															
	10	1															
	11	Result Sts Code															

Request Area Description:

DTIM Period: 1-255

If 1 is set, DTIM is set to every TBTT.

Default: 1

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-25. [ID: 0245h] Set GameInfo Command

Sets game-specific information for embedding into Beacons. Only valid in Parent mode and CLASS3 state.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0245h															
	7	$1+(n+1)/2$															
	8	GameInfo Length (n)															
	9- $8+(n+1)/2$	GameInfo															
Confirm	$9+(n+1)/2$	0245h															
	$10+(n+1)/2$	1															
	$11+(n+1)/2$	Result Sts Code															

GameInfo Length: 0-128

Length of GameInfo in bytes. Default is 0.

GameInfo:

Game-specific information. Nothing is set in this field if GameInfo Length is 0.

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-26. [ID: 0246h] Set VBlank_TSF Command

This command is used by the Parent/AP only.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0246h															
	7	1															
	8	VBlank_TSF Value															
Confirm	9	0246h															
	10	1															
	11	Result Sts Code															

VBlank_TSF Value: a 16 bit value

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-27. [ID: 0247h] Set Allow/Deny MAC Address List Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0247h															
	7	Length															
	8	MAC List Enable Flag															
	9	Count															
	10-n	MAC List															
Confirm	n	0247h															
	n+1	1															
	n+2	Result Sts Code															

Length: $2 + \text{Count} * \text{sizeof}(\text{MAC List entry})/2$. This is in 16 bit words.

Note: If Count is zero Length is 2.

MAC List Enable Flag:

- 0 – disable MAC checking
- 1 – Allow associations only for entries on this list
- 2 – Deny associations for entries on this list

Count: number of MAC List entries. Max values as follows:

AP	--	128
STA	--	32

MAC List: An array of MAC list entries

A MAC list entry is:

Word	Description
0-2	Macaddr

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-5-28. [ID: 0248h] Set RTS Threshold Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0248h															
	7	1															
	8	RTS Threshold															
Conf rm	9	0248h															
	10	1															
	11	Result Sts Code															

RTS Threshold: max packet size allowed without using RTS.

Result Sts Code: See Table 3-1

5-5-29. [ID: 0249h] Set Fragmentation Threshold Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0249h															
	7	1															
	8	Fragmentation Threshold															
Conf rm	9	0249h															
	10	1															
	11	Result Sts Code															

Fragmentation Threshold: max packet size allowed without using fragmentation.

Minimum fragmentation threshold is 256 bytes.

Maximum fragmentation threshold is 2346 bytes.

Result Sts Code: See Table 3-1

5-5-30. [ID: 024Ah] Set WPA Passphrase Command**Command Packet:**

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	024Ah															
	7	33															
	8	WPA Passphrase Length															
	9-40	WPA Passphrase															
Confirm	41	024Ah															
	42	1															
	43	Result Sts Code															

WPA Passphrase Length:

Length of passphrase (bytes)

Valid lengths are 8 through 64 inclusive.

WPA Passphrase:

A string of hexadecimal bytes.

Result Sts Code: See Table 3-1

5-5-31. [ID: 024Bh] Set EEROM Content Command

This command overwrites the existing country code entry in the wireless device's EEROM.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	024Bh															
	7	2															
	8-9	Country Code															
Conf rm	10	024Bh															
	11	1															
	12	Result Sts Code															

Country Code:

A NULL terminated string. The fourth byte is always NULL.

The first three bytes are a NULL terminated ascii country code string, e.g. "US", "JP", "AU", etc.

Result Sts Code: See Table 3-1

5-5-32. [ID: 024Dh] Set TX Power Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	024Dh															
	7	1															
	8	TX Power															
Conf rm	9	024Dh															
	10	1															
	11	Result Sts Code															

TX Power:

Maximum Transmitter output power in qdbm.

The original maximum power setting according the device's current locale may be restored by issuing this command with TX Power set to 0xFFFF.

Attempts to set transmitter power higher than permitted by current locale will be rejected.

Note: The current locale is selected by cmd 0203h, Set Country Code Command.

Expected usage of this command is as follows:

- 1- Device configuration followed by CLASS1 and Join or Start commands.
- 2- Set Max TX Power, use value = 0xFFFF
- 3- Get Max TX Power (cmd 0x2CD)
- 4- Set Max TX Power to a value less than or equal to the value obtained in previous step.

If it is necessary to change country code or operating channel then the IDLE command should be issued and the above sequence repeated.

Note:s

- 1- Setting TX Power to a value greater than the maximum permitted will result in TX Power being set to the maximum permitted by locale.

The units of TX Power are in quarter dbm where 1dbm = 4qdbm.

Result Sts Code: See Table 3-1

-2- TX Power settling time depends on the magnitude of the adjustment and the transmission rate.

A settling time can be estimated by:

Settling_Time = (# of 0.5 dbm steps) * Time_per_step

Where Time_per_step is approximately:

- 500 microseconds (54 Mbps, OFDM)
- 10 milliseconds (1 Mbps, DSSS)

5-5-33. [ID: 024Eh] Set Multicast Rate Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	024Eh															
	7	1															
	8	Multicast Rate Value															
Conf rm	9	024Eh															
	10	1															
	11	Result Sts Code															

Multicast Rate Value:

Valid rates are 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps. These are selected according to the table below.

To restore default operation (where multicast rates are automatically selected by the driver) set Multicast Rate Value to 0. All other values refer directly to a rate in Mbps.

Rate (Mbps)	Multicast Rate Value
1	2
2	4
5.5	11
6	12
9	18
11	22
12	24
18	36
24	48
36	72
48	96
54	108
Auto	0

Result Sts Code: See Table 3-1

5-6. Parameter Get Command Details

5-6-1. [ID: 0280h] Get All Parameter Command

Gets all parameters at once including Station Mac Address, Short Retry Limit, Enable Channel, Operation Mode, et al.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0280h															
	7	0															
Confirm	8	0280h															
	9	33															
	10	Result Sts Code															
	11-13	Station MAC Address															
	14	Short Retry Limit															
	15	Enable Channel															
	16	Channel															
	17	Operation Mode															
	18	Reserved															
	19	Security Mode															
	20	WEP Default KeyID															
	21	Beacon Frame Type															
	22	Broadcast SSID Probe Request Response															
	23	Beacon Lost Threshold															
	24	Reserved															
	25-40	SSID Mask															
	41	Preamble Type															
	42	Authentication Algorithm															
	43	Long Retry Limit															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

For definition of each field, refer to the individual parameter Set/Get commands.

5-6-2. [ID: 0281h] Get Mac Address Command

Get the station's MAC Address.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0281h															
	7	0															
Confirm	8	0281h															
	9	4															
	10	Result Sts Code															
	11-13	Station MAC Address															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are only set with the result of SUCCESS.

Station MAC Address:

MAC address of the station.

5-6-3. [ID: 0282h] Get Retry Limits Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0282h															
	7	0															
Confirm	8	0282h															
	9	2															
	10	Result Sts Code															
	11	Short Retry Limit															
	12	Long Retry Limit															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Short Retry Limit: 1-255

Long Retry Limit: 1-255

5-6-4. [ID: 0283h] Get Enable Channel Command

Gets list of all allowed channels for current country code setting plus the current channel in use.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0283h															
	7	0															
Confirm	8	0283h															
	9	5															
	10	Result Sts Code															
	11	EnableChannel															
	12	Channel															
	13-14	Country Code															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

EnableChannel:

Bitmap of channels that are available for use. Bits set to 1 indicate valid channels.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	rsv	14	13	12	11	10	9	8	7	6	5	4	3	2	1	rsv

Channel:

Number of the channel currently in use.

ADD:

Country Code: NULL terminated byte string containing country code. A country code is up to three bytes of ascii chars. Byte 4 of this string is ALWAYS NULL.

5-6-5. [ID: 0284h] Get Operation Mode Command

Gets the operation mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0284h															
	7	0															
Confirm	8	0284h															
	9	2															
	10	Result Sts Code															
	11	Operation Mode															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Operation Mode

(See Set Operation Mode 0x204 for values)

5-6-6. [ID: 0285h] Get Rateset Command

Gets the rate used for unicast data frames.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0285h															
	7	0															
Confirm	8	0285h															
	9	3															
	10	Result Sts Code															
	11	Supported Rates															
	12	Basic Rates															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Supported Rates, Basic Rates:

(See Set Rate Command 0x205 for values)

5-6-7. [ID: 0286h] Get Security Mode Command

Get the WEP mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0286h															
	7	0															
Confirm	8	0286h															
	9	2															
	10	Result Sts Code															
	11	WEP Mode															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Security Mode:

See Set Security Mode Command 0x206 for values

5-6-8. [ID: 0287h] Get WEP Default KeyID Command

Gets the default WEP KeyID.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0287h															
	7	0															
Confirm	8	0287h															
	9	2															
	10	Result Sts Code															
	11	WEP Default KeyID															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

WEP Default KeyID:

See Set WEP Default KeyID Command 0x207 for values

5-6-9. [ID: 0289h] Get Beacon Frame Type Command

Gets the Beacon Frame Type.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0289h															
	7	0															
Confirm	8	0289h															
	9	2															
	10	Result Sts Code															
	11	Beacon Frame Type															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Beacon Frame Type:

See Set Beacon Frame Type Command 0x209 for values

5-6-10. [ID: 028Ah] Get Broadcast SSID Probe Response Command

Get the current setting of whether to respond to Probe Requests with Broadcast SSID.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	028Ah															
	7	0															
Confirm	8	028Ah															
	9	2															
	10	Result Sts Code															
	11	Broadcast SSID Probe Response															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Broadcast SSID Probe Response:

See Set Broadcast SSID Probe ResponseCommand 0x20A for values

5-6-11. [ID: 028Bh] Get Beacon Lost Threshold Command

Get the Beacon Lost Threshold setting.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	028Bh															
	7	0															
Confirm	8	028Bh															
	9	2															
	10	Result Sts Code															
	11	Beacon Lost Threshold															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Beacon Lost Threshold:

See Set Beacon Lost Threshold Command 0x20B for values

5-6-12. [ID: 028Ch] Get Active Zone Command

Gets the time for Parent to remain in Active state after TBTT. (In child mode the parent's setting is used to determine ActiveZone.)

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	028Ch															
	7	0															
Confirm	8	028Ch															
	9	2															
	10	Result Sts Code															
	11	Active Zone Time															

ConfirmArea Description :

Result Sts Code :

Refer to Table 3-1.

5-6-13. [ID: 028Dh] Get SSID Mask Command

Gets the mask data for SSID matching test.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	028Dh															
	7	0															
Confirm	8	028Dh															
	9	17															
	10	Result Sts Code															
	11-26	SSID Mask															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

SSID Mask:

See Set SSID Mask Command 0x20D for values

5-6-14. [ID: 028Eh] Get Preamble Type Command

Gets Preamble Type.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	028Eh															
	7	0															
Confirm	8	028Eh															
	9	2															
	10	Result Sts Code															
	11	Preamble Type															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Preamble Type:

See Set Preamble Type Command 0x20E for values

5-6-15. [ID: 028Fh] Get Authentication Algorithm Command

Gets the Authentication Algorithm setting.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	028Fh															
	7	0															
Confirm	8	028Fh															
	9	2															
	10	Result Sts Code															
	11	Authentication Algorithm															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Authentication Algorithm:

See Set Authentication Algorithm Command 0x20F for values

5-6-16. [ID: 0292h] Get Max Connectable Child Command

Gets the maximum number of children accepted when in Parent mode.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0292h															
	7	0															
Confirm	8	0292h															
	9	2															
	10	Result Sts Code															
	11	Count															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Count:

See Set Max Connectable Child Command 0x212 for values

5-6-17. [ID: 0293h] Get Tx Antenna Command

Gets the tx antenna in use.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0293h															
	7	0															
Confirm	8	0293h															
	9	2															
	10	Result Sts Code															
	11	Use Antenna															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Use Antenna:

See Set Tx Antenna Command 0x213 for values

5-6-18. [ID: 0294h] Get Antenna Diversity Command

Gets the Diversity Mode setting and currently active antenna.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0294h															
	7	0															
Confirm	8	0294h															
	9	3															
	10	Result Sts Code															
	11	Diversity Mode															
	12	Use Antenna															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Diversity Mode:

Use Antenna:

See Set Antenna Diversity Command 0x214 for values

5-6-19. [ID: 0295h] Get Enable Beacon Send/Recv Indication Command

Gets the setting for beacon send/recv transmit enable/disable.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0295h															
	7	0															
Confirm	10	0295h															
	11	3															
	12	Result Sts Code															
	13	Enable Send															
	14	Enable Receive															

Confirm Area Description:

Enable Send, Enable Receive:

See Set Beacon Recv Indication Command 0x215 for values

5-6-20. [ID: 0296h] Get Interference Mode Command

Gets the interference mitigation mode in use.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0296h															
	7	0															
Confirm	8	0296h															
	9	2															
	10	Result Sts Code															
	11	Interference Mode															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Interference Mode:

See Set Interference Mode Command 0x216 for values

5-6-21. [ID: 02C0h] Get BSSID Command

Get the BSSID for the current BSS.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C0h															
	7	0															
Confirm	8	02C0h															
	9	4															
	10	Result Sts Code															
	11-13	BSSID															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

BSSID:

BSSID

5-6-22. [ID: 02C1h] Get SSID Command

Gets SSID Length& SSID for the current BSS.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C1h															
	7	0															
Confirm	8	02C1h															
	9	18															
	10	Result Sts Code															
	11	SSID Length															
	12-27	SSID															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

SSID Length:

SSID string length

SSID:

SSID for the BSS

5-6-23. [ID: 02C2h] Get Beacon Period Command

Gets the BSS Beacon Period

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C2h															
	7	0															
Confirm	8	02C2h															
	9	2															
	10	Result Sts Code															
	11	Beacon Period															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Beacon Period:

See Set Beacon Period Command 0x242 for values

5-6-24. [ID: 02C3h] Get DTIM Period Command

Gets the DTIM Period (number of Beacons) for the BSS.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C3h															
	7	0															
Confirm	8	02C3h															
	9	2															
	10	Result Sts Code															
	11	DTIM Period															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

DTIM Period:

See Set DTIM Period Command 0x243 for values

5-6-25. [ID: 02C5h] Get GameInfo Command

Gets the GameInfo contents. In Parent mode, gets the GameInfo that has been set with Set GameInfo. In Child mode, gets the GameInfo that was included in the last Beacon received.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C5h															
	7	0															
Confirm	8	02C5h															
	9	$2+(n+1)/2$															
	10	Result Sts Code															
	11	GameInfo Length (n)															
	12-	GameInfo															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

GameInfo Length: 0-128

Length of GameInfo in bytes

GameInfo:

Game-specific information

5-6-26. [ID: 02C6h] Get Vblank_TSF Command

This command is used by the STA/child to retrieve a Vblank TSF value received in beacon frames.

The AP/parent may use this command for testing purposes.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C6h															
	7	0															
Confirm	8	02C6h															
	9	2															
	10	Result Sts Code															
	11	Vblank_TSF															

Confirm Parameters:

Vblank TSF: a 16 bit value

Note: The Vblank_TSF value is normally SET by the AP/Parent, see command [ID: 0246h].

The Vblank_TSF is received in the beacon frames by the STA/child and retrieved by upper layers using this GET command.

5-6-27. [ID: 02C7h] Get Allow/Deny MAC Address List Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C7h															
	7	0															
Confirm	8	02C7h															
	9	Length															
	10	Result Sts Code															
	11	MAC Enable Flag															
	12	Count															
	13-n	MAC List															

Confirm Parameters:

Length: number of 16 bit words starting from offset 10

3 + (Count * sizeof(MAC List Entry)/2)

Result Sts Code:

Shows result status code. Refer to Table 3-1.

MAC Enable Flag: Values per Set AllowDeny MAC Address List command, 0247h

Count: Number of MAC List entries

MAC List: an array of MAC List entries, see Set MAC List Command, 0247h for details

5-6-28. [ID: 02C8h] Get RTS Threshold Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C8h															
	7	0															
Confirm	8	02C8h															
	9	2															
	10	Result Sts Code															
	11	RTS Threshold Value															

Confirm Parameters:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

RTS Threshold Value: value as set by command 0248h, Set RTS Threshold Command.

5-6-29. [ID: 02C9h] Get Fragmentation Threshold Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02C9h															
	7	0															
Confirm	8	02C9h															
	9	2															
	10	Result Sts Code															
	11	Fragmentation Threshold Value															

Confirm Parameters:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Fragmentation Threshold Value: value as set by command 0249h, Set Fragmentation Threshold Command.

5-6-30. [ID: 02CBh] Get EEROM Content Command

This command retrieves the country code from the wireless device’s EEROM.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02CBh															
	7	0															
Confirm	8	02CBh															
	9	3															
	10	Result Sts Code															
	11-12	Country Code															

Confirm Parameters:

Result StsCode: Refer to Table 3-1

Country Code: A NULL terminated string. Max length is four bytes including NULL terminator.

5-6-31. [ID: 02CCh] Get RSSI and Rate Info Command

This command is used by both AP/Parent and STA/Child to retrieve RSSI and Rate information maintained by WL.

AP/Parent maintains per association values of RSSI and Rate which are moving averages over last eight (8) received data frames.

STA/Child maintains values of RSSI and Rate which are moving averages over last eight (8) received data frames.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02CCh															
	7	0															
Confirm	8	02CCh															
	9	Length															
	10	Result Sts Code															
	11	TSSI															
	12	Count															
	13-n	Info Structures															

Confirm Parameters:

Count: number of info structures returned with this response. For a child/STA this is always 1. For an AP/Parent the max value of count is the maximum number of associations permitted for the current mode.

Length:

$3 + (\text{Count} * \text{sizeof}(\text{info structure})/2)$

Note: length is number of 16 bit words starting at offset 10.

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Info structure details:

Word	15-8	7-0
0	RSSI	
1	TxRate	
2	RxRate	
3-5	PeerMac	

Notes:

RSSI is moving average of last 8 frames received. It is a signed 8 bit value, range -128 → 127 dbm.

Rate is moving average of last 64 frames received, rounded down to nearest valid rate. The units are 500 kbps.

PeerMAC is MAC address of peer from which frames are received.

TSSI value is in qdbm. The maximum value is locale dependent.

Note: This command may be issued in any state but the values returned are only usable when the wireless driver is in CLASS3 state.

5-6-32. ID: 02CDh] Get TX Power Command**Command Packet:**

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02CDh															
	7	0															
Confirm	8	02CDh															
	9	2															
	10	Result Sts Code															
	11	TX Power Value															

Confirm Parameters:**Result Sts Code:**

Shows result status code. Refer to Table 3-1.

TX Power Value: current transmit power in qdbm (quarter dbm).

5-6-33. ID: 02CEh] Get Multicast Rate Command

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	02CEh															
	7	0															
Confirm	8	02CEh															
	9	2															
	10	Result Sts Code															
	11	Multicast Rate Value															

Confirm Parameters:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Multicast Rate Value:

See “Set Multicast Rate Command (024Eh) for value descriptions.

5-6-34. [ID: 0302h] IDLE Command

Puts driver and hardware in IDLE state.

Consequences:

Drop associations, authentications

Turn off radio, disable MAC

Leave parameters unchanged.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0302h															
	7	0															
Confirm	8	0302h															
	9	1															
	10	Result Sts Code															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-6-35. [ID: 0303h] CLASS1 Command

Changes Wireless Library from IDLE state to CLASS1 state.

Consequences:

Sets a flag. Allow some commands to execute per Table 4-1.

Turn on radio and MAC.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0303h															
	7	0															
Confirm	8	0303h															
	9	1															
	10	Result Sts Code															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-6-36. [ID: 0304h] Restart Command

Restarts driver and hardware. All parameters are reset to default values, and the state is set to IDLE.

Consequences:

Drop associations, authentications

Turn off radio, disable MAC

Set parameters to default values

Clear SSID.

Enter IDLE state

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0304h															
	7	0															
Confirm	8	0304h															
	9	1															
	10	Result Sts Code															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

Parameters restored to default values:

Parameter Name	Cmd ID	Value
Long Retry Limit	202h	4
Short Retry Limit	202h	7
Security Mode	206h	0 (none)
WEP Keys	208h	All zeroes
WEP Default Key Index	207h	0
Beacon Frame Type	209h	0 (include SSID in beacon frames)
Broadcast SSID Probe Response	20Ah	0 (respond to probe requests with broadcast ssid)
Beacon Lost Threshold	20Bh	16

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Active Zone	20Ch	0xFFFF
SSID Mask	20Dh	All zeroes
Preamble	20Eh	1 (short preamble)
Authentication Algorithm	20Fh	0 (Open)
Antenna Diversity	214h	0,1 (ON, use antenna zero)
Enable Beacon Send/Recv Indications	215h	0,0 (both disabled)
Beacon Period	242h	16
DTIM Period	243h	1

Notes:

-1- Active Zone default value is set if and only if operating mode is set for nitro parent.

5-6-37. [ID: 0305h] Set Initialize Wireless Counter Command

Sets all Wireless Counters to zero.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0305h															
	7	0															
Confirm	8	0305h															
	9	1															
	10	Result Sts Code															

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

5-6-38. [ID: 0306h] Get Version Command

Gets version information for Wireless Library and hardware.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0306h															
	7	0															
Confirm	8	0306h															
	9	65															
	10	Result Sts Code															
	11-50	WL Version String															
	51-74	Rev Info Structure															

Confirm Area Description:

WL Version String: a null terminated byte string, 80 bytes max (including terminator)

Rev Info Structure:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Rev Info Structure	0-1	vendorid															
	2-3	deviceid															
	4-5	radiorev															
	6-7	chiprev															
	8-9	corerev															
	10-11	boardid															
	12-13	boardvendor															
	14-15	boardrev															
	16-17	driverrev															
	18-19	ucoderev															
	20-21	bus															
	22-23	chipnum															

vendorid: PCI vendor id
 deviceid: device id of chip
 radiorev: radio revision
 chiprev: chip revision
 corerev: core revision
 boardid: board identifier (usu. PCI sub-device id)
 boardvendor: board vendor (usu. PCI sub-vendor id)
 boardrev: board revision

driverrev:	driver version
ucoderev:	microcode version
bus:	bus type
chipnum:	chip number

Result Sts Code:
Shows result status code. Refer to Table 3-1.

5-6-39. [ID: 0307h] Get Wireless Counter Command

Gets counter values for Wireless NIC Tx/Rx frames, errors, etc.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0307h															
	7	0															
Confirm 11	8	0307h															
	9	323															
	10	Result Sts Code															
	11	Reserved															
	12	Version															
	13	Wl Counters Length															
	14-15	txframe															
	16-17	txbyte															
	18-19	txretrans															
	20-21	txerror															
	22-23	txctl															
	24-25	txprshort															
	26-27	txserr															
	28-29	txnobuf															
	30-31	txnoassoc															
	32-33	txrunt															
	34-35	txchit															
	36-37	txcmis															
	38-39	txuflo															
	40-41	txphyerr															
	42-43	txphycrs															
	44-45	rxframe															
	46-47	rxbyte															
	48-49	rxerror															
	50-51	rxctl															
	52-53	rxnobuf															
	54-55	rxnondata															
	56-57	rxbadbs															
	58-59	rxbadcm															
	60-61	rxfragerr															
	62-63	rxrunt															
	64-65	rxgiant															
	66-67	rxnoscb															
	68-69	rxbadproto															
	70-71	rxbadsrcmac															
	72-73	rxbadba															
	74-75	rxfilter															
	76-77	rxoflo 0															

78-79	rxuflo 0
80-81	rxuflo 1
82-83	rxuflo 2
84-85	rxuflo 3
86-87	rxuflo 4
88-89	rxuflo 5
90-91	dllcnt_txrts_off
92-93	dllcnt_rxcrc_off
94-95	dllcnt_txnocs_off
96-97	dmade
98-99	dmada
100-101	dmape
102-103	reset
104-105	tbtt
105-106	txdmawar
106-107	pkt_callback_reg_fail
108-109	txallfrm
110-111	txrtsfrm
112-113	txctsfrm
114-115	txackfrm
116-117	RESERVED
118-119	txbcnfrm
120-121	txfunfl 0
122-123	txfunfl 1
124-125	txfunfl 2
126-127	txfunfl 3
128-129	txfunfl 4
130-131	txfunfl 5
132-133	txfunfl 6
134-135	txfunfl 7
136-137	txtplunfl
138-139	txphyerror
140-141	rxfrmtoolong
142-143	rxfrmtooshrt
144-145	rxinvmachdr
146-147	rxbadfcs
148-149	rxbadplcp
150-151	rxcrs glitch
152-153	rxstrt
154-155	rxdfmucastmbss
156-157	rxmfrmucastmbss
158-159	rxcfmucast
160-161	rxrtsucast
162-163	rxctsucast
164-165	rxackucast
166-167	rxdfrmocast
168-169	rxmfrmocast
170-171	rxcfmcast
172-173	rxrtsocast

174-175	rxctsocast
176-177	rxdfmmcast
178-179	rxmfrmmcast
180-181	rxcfmmcast
182-183	rxbeaconmbss
184-185	rxdfrmucastobss
186-187	rxbeaconobss
188-189	bcntxcancel
190-191	rxf0ovfl
192-193	RESERVED
194-195	RESERVED
196-197	RESERVED
198-199	pmqovfl
200-201	rxcgprqfrm
202-203	rxcgprsqovfl
204-205	txcgprsfail
206-207	txcgprssuc
208-209	prs_timeout
210-211	rxnack
212-213	frmscons
214-215	txnack
216-217	txglitch_nack
218-219	txburst
220-221	txfrag
222-223	txmulti
224-225	txfail
226-227	txretry
228-229	txretrie
230-231	rxdup
232-233	txrts
234-235	txnocts
236-237	txnoack
238-239	rxfrag
240-241	rxmulti
242-243	rxerc
244-245	txfrmsnt
246-247	rxundec
248-249	tkipmicfaill
250-251	tkipentrmsr
252-253	tkipreplay
254-255	ccmpfnterr
256-257	ccmpreplay
258-259	ccmpundec
260-261	fourwayfail
262-263	wepundec
264-265	wepicverr
266-267	decsuccess
268-269	tkipicverr

270-271	wepexcluded
272-273	txchanrej
274-275	txnitro
276-277	txnitrofail
278-279	txqfull
280-281	txnullkeydata
282-283	rxmp
284-285	rxkeydata
286-287	rxnullkeydata
288-289	rxbadnitro
290-291	rxdupnitro
292-293	rxmpack
294-295	istatus
296-297	retrans
298-299	rxkeyerr 0
300-301	rxkeyerr 1
302-303	rxkeyerr 2
304-305	rxkeyerr 3
306-307	rxkeyerr 4
308-309	rxkeyerr 5
310-311	rxkeyerr 6
312-313	rxkeyerr 7
314-315	rxkeyerr 8
316-317	rxkeyerr 9
318-319	rxkeyerr 10
320-321	rxkeyerr 11
322-323	rxkeyerr 12
324-325	rxkeyerr 13
326-327	rxkeyerr 14
328-329	rx_good_pkt
330-331	rx_bad_pkt
332-333	tx_good_pkt
334-335	tx_bad_pkt
336-337	rx_ocast_good_pkt

Confirm Area Description:

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

Reserved:

Reserved; do not set anything

Wl Counters length:

Length in bytes of wireless counters

Version:

Version of wl_cnt_t structure

```

/* transmit stat counters */
    txframe; /* tx data frames */
    txbyte;      /* tx data bytes */
    txretrans;   /* tx mac retransmits */
    txerror; /* tx data errors */
    txctl;       /* tx management frames */
    txprshort;   /* tx short preamble frames */
    txserr;      /* tx status errors */
    txnobuf; /* tx out of buffers errors */
    txnoassoc;   /* tx discard because we're not associated */
    txrunt;      /* tx runt frames */
    txchit;      /* tx header cache hit (fastpath) */
    txcmis; /* tx header cache miss (slowpath) */

/* transmit chip error counters */
    txuflo;      /* tx fifo underflows */
    txphyerr;    /* tx phy errors (indicated in tx status) */
    txphycrs;    /* PR8861/8963 counter */

/* receive stat counters */
    rxframe; /* rx data frames */
    rxbyte;      /* rx data bytes */
    rxerror; /* rx data errors */
    rxctl;       /* rx management frames */
    rxnobuf; /* rx out of buffers errors */
    rxnondata;   /* rx non data frames in the data channel errors */
    rxbadbs; /* rx bad DS errors */
    rxbadcm;     /* rx bad control or management frames */
    rxfragerr;   /* rx fragmentation errors */
    rxrunt;      /* rx runt frames */
    rxgiant; /* rx giant frames */
    rxnoscb; /* rx no scb error */
    rxbadproto;  /* rx invalid frames */
    rxbadsrcmac; /* rx frames with Invalid Src Mac */

```



```

    rxbadda;          /* rx frames tossed for invalid da */
    rxfilter; /* rx frames filtered out */

/* receive chip error counters */
    rxoflo;           /* rx fifo overflow errors */
    rxuflo[NFIFO];    /* rx dma descriptor underflow errors */

    dllcnt_txrts_off; /* dllcnt txrts value when reset dllcnt */
    dllcnt_rxcrc_off; /* dllcnt rxrc value when reset dllcnt */
    dllcnt_txnocs_off; /* dllcnt txnocs value when reset dllcnt */

/* misc counters */
    dmade;           /* tx/rx dma descriptor errors */
    dmada;           /* tx/rx dma data errors */
    dmape;           /* tx/rx dma descriptor protocol errors */
    reset;           /* reset count */
    tbtt;            /* cnts the TBTT int's */
    txdmawar;        /* # occurrences of PR15420 workaround */
    pkt_callback_reg_fail; /* callbacks register failure */

/* MAC counters: 32-bit version of d11.h's macstat_t */
    txallfrm;        /* total number of frames sent, incl. Data, ACK, RTS,
CTS,
                                * Control Management (includes retransmissions)
                                */
    txrtsfrm;        /* number of RTS sent out by the MAC */
    txctsfrm;        /* number of CTS sent out by the MAC */
    txackfrm;        /* number of ACK frames sent out */
    txdnlfm;         /* Not used */
    txbcnfrm;        /* beacons transmitted */
    txfunfl[8];      /* per-fifo tx underflows */
    txtplunfl;       /* Template underflows (mac was too slow to transmit
ACK/CTS
                                * or BCN)
                                */
    txphyerror;      /* Transmit phy error, type of error is reported in tx-status

```

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```

for
    * driver enqueued frames
    */
    rxfrmtoolong; /* Received frame longer than legal limit (2346 bytes) */
    rxfrmtoshrt; /* Received frame did not contain enough bytes for its
frame type */
    rxinvmachdr; /* Either the protocol version != 0 or frame type not
    * data/control/management
    */
    rxbadfcs; /* number of frames for which the CRC check failed in the
MAC */
    rxbadplcp; /* parity check of the PLCP header failed */
    rxcrs glitch; /* PHY was able to correlate the preamble but not the
header */
    rxstrt; /* Number of received frames with a good PLCP
    * (i.e. passing parity check)
    */
    rxdfrmucastmbss; /* Number of received DATA frames with good FCS and
matching RA */
    rxmfrmucastmbss; /* number of received mgmt frames with good FCS and
matching RA */
    rxcfmucast; /* number of received CNTRL frames with good FCS and
matching RA */
    rxrtsucast; /* number of unicast RTS addressed to the MAC (good
FCS) */
    rxctsucast; /* number of unicast CTS addressed to the MAC (good
FCS) */
    rxackucast; /* number of ucast ACKS received (good FCS) */
    rxdfrmocast; /* number of received DATA frames (good FCS and not
matching RA) */
    rxmfrmocast; /* number of received MGMT frames (good FCS and not
matching RA) */
    rxcfmocast; /* number of received CNTRL frame (good FCS and not
matching RA) */
    rxrtsocast; /* number of received RTS not addressed to the MAC */
    rxctsocast; /* number of received CTS not addressed to the MAC */

```

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```

        rxdfmmcast;    /* number of RX Data multicast frames received by the
MAC */

        rxmfrmmcast;   /* number of RX Management multicast frames received
by the MAC */

        rxcfrmmcast;   /* number of RX Control multicast frames received by the
MAC

                        * (unlikely to see these)
                        */

        rxbeaconmbss;  /* beacons received from member of BSS */

        rxdfmucastobss; /* number of unicast frames addressed to the MAC from
                        * other BSS (WDS FRAME)
                        */

        rxbeaconobss;  /* beacons received from other BSS */

        rxrsptmout;    /* Number of response timeouts for transmitted frames
                        * expecting a response
                        */

        bcntxcancel;    /* transmit beacons canceled due to receipt of beacon
(IBSS) */

        rxf0ovfl; /* Number of receive fifo 0 overflows */
        rxf1ovfl; /* Number of receive fifo 1 overflows (obsolete) */
        rxf2ovfl; /* Number of receive fifo 2 overflows (obsolete) */
        txsfovfl; /* Number of transmit status fifo overflows (obsolete) */
        pmqovfl; /* Number of PMQ overflows */

        rxcgprqfrm;     /* Number of received Probe requests that made it into
                        * the PRQ fifo
                        */

        rxcgprsqovfl;    /* Rx Probe Request Que overflow in the AP */
        txcgprsfail;     /* Tx Probe Response Fail. AP sent probe response but did
                        * not get ACK
                        */

        txcgprssuc;     /* Tx Probe Response Success (ACK was received) */
        prs_timeout;     /* Number of probe requests that were dropped from the
PRQ

                        * fifo because a probe response could not be sent out
within

                        * the time limit defined in M_PRS_MAXTIME

```

```

        */
    rxnack;        /* Number of NACKS received (Afterburner) */
    frmscons;      /* Number of frames completed without transmission
because of an
        * Afterburner re-queue
        */
    txnack;        /* Number of NACKs transmitted (Afterburner) */
    txglitch_nack; /* obsolete */
    txburst; /* obsolete */

/* 802.11 MIB counters, pp. 614 of 802.11 reaff doc. */
    txfrag;        /* dot11TransmittedFragmentCount */
    txmulti; /* dot11MulticastTransmittedFrameCount */
    txfail;        /* dot11FailedCount */
    txretry; /* dot11RetryCount */
    txretrie; /* dot11MultipleRetryCount */
    rxdup;        /* dot11FrameduplicateCount */
    txrts;        /* dot11RTSSuccessCount */
    txnocts; /* dot11RTSFailureCount */
    txnoack; /* dot11ACKFailureCount */
    rxfrag;        /* dot11ReceivedFragmentCount */
    rxmulti; /* dot11MulticastReceivedFrameCount */
    rxcrc;        /* dot11FCSErrorCount */
    txfrmsnt;      /* dot11TransmittedFrameCount (bogus MIB?) */
    rxundec; /* dot11WEPUndecryptableCount */

/* WPA2 counters (see rxundec for DecryptFailureCount) */
    tkipmicfail;   /* TKIPLocalMICFailures */
    tkipcntrmsr;   /* TKIPCounterMeasuresInvoked */
    tkipreplay;    /* TKIPReplays */
    ccmpfmterr;    /* CCMPFormatErrors */
    ccmpreplay;    /* CCMPReplays */
    ccmpundec;     /* CCMPDecryptErrors */
    fourwayfail;   /* FourWayHandshakeFailures */
    wepundec;      /* dot11WEPUndecryptableCount */
    wepicverr;     /* dot11WEPICVErrorCount */

```

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```
decsuccess;      /* DecryptSuccessCount */
tkipicverr;      /* TKIPICVErrorCount */
wepexcluded;     /* dot11WEPExcludedCount */

txchanrej;       /* Tx frames suppressed due to channel rejection */
```

```
/* Nitro protocol stats */
```

```
txnitro;         /* Nitro frames (MP or Keydata) transmitted */
txnitro_fail;    /* Nitro frames transmission fail */
txqfull;         /* Child: nitro txq is full */
txnullkeydata;   /* Child: TX NULL Keydata frames */
rxmp;            /* MP frames received */
rxkeydata;       /* Keydata frames received */
rxnullkeydata;   /* NULL Keydata frames received */
rxbadnitro;      /* Bad Nitro frames received */
rxdupnitro;      /* Duplicate Nitro frames received */
rxmpack;         /* MPACK frames received */
istatus;         /* Intermediate Status */
retrans;         /* Retransmissions */
rxkeyerr[MAX_NITRO_STA_ALLOWED]; /* Key response error per sta */
```

```
/* Packet count stats */
```

```
rx_good_pkt;     /* good rx pkts */
rx_bad_pkt;      /* bad rx pkts */
tx_good_pkt;     /* good tx pkts */
tx_bad_pkt;      /* bad tx pkts */
rx_ocast_good_pkt; /* othercast rx */
```

5-6-40. [ID: 0308h] **Get WL State Command**

Gets current state of Wireless Library.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0308h															
	7	0															
Confirm	8	0308h															
	9	2															
	10	Result Sts Code															
	11	Station State															

Confirm Area Description:

Station State:

0010h: IDLE

0020h: CLASS1

0030h: CLASS2

0040h: CLASS3

Result Sts Code:

Shows result status code. Refer to Table 3-1.

The following fields are set only when the result is SUCCESS.

5-6-41. [ID: 0309h] Test Signal Command

This command is used to send or stop test signal transmission.

This command is for TESTING ONLY; generating these signals is disruptive to normal operation.

Command Packet:

Area	Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Request	0-5	Reserved															
	6	0309h															
	7	4															
	8	Control															
	9	Signal															
	10	Rate															
	11	Channel															
Conf rm	12	0309h															
	13	1															
	14	Result Sts Code															

Request area description:

Control: control the send and stop of test signal. If it is set to Stop then the Signal., Rate and Channel fields are ignored.

0000h ... send stop

0001h ... send start

Signal: select the types of test signal

0000h ... test tone

0001h ... suppressed carrier

0002h ... EVM

Rate: select test signal rate

0001h ... 1MBPS

0002h ... 2MBPS

0003h ... 5.5 MBPS

0004h ... 11 MBPS

0005h ... 6 MBPS

0006h ... 9 MBPS

0007h ... 12 MBPS

0008h ... 18 MBPS

0009h ... 24 MBPS

000Ah ... 36 MBPS

000Bh ... 48 MBPS

000Ch ... 54 MBPS

NOTE:

- 1- Rates 1,2,5.5,11 MBPS are CCK
- 2- Rates 6,9,12,18,24,36,48,54 MBPS are OFDM
- 3- Only CCK rates are valid for the EVM test
- 3- This command does not send arbitrary packet data. For that purpose we suggest WD should simply queue up data packets to be sent, i.e normal operation.

Channel: select transmission channel

1-14

Confirm Area description:

Result Sts Code: Shows result status code. Refer to Table 3-1.

Notes about Signal Types and Test Applications

All of these tests require a calibrated receiver to verify the transmitted signal.

One typically sets up a device under test (DUT) to generate the signal and an appropriate signal analyzer to receive and compare the signal to desired performance criteria.

Commercial devices to receive and analyze these signals are available.

-1- Test Tone

This test causes the hardware to generate a signal at the center frequency of the selected channel. It is used to verify the ability of the hardware to generate a signal of the correct frequency.

-2- Suppressed Carrier

This test generates a signal with the carrier frequency suppressed.

Refer to section 18.4.7.7 of IEEE 802.11b-1999 (Supplement to ANSI/IEEE Std 802.11, 1999 Edition) for more information.

-3- EVM

This test is used to test transmit modulation accuracy.

Refer to section 18.4.7.8 of IEEE 802.11b-1999 (Supplement to ANSI/IEEE Std 802.11, 1999 Edition) for more information.

-4- How to use this command

- a- Issue cmd 309 with Control set to 1 and rate, channel, test type parameters set as desired.

-b- Perform desired measurements

-c- Issue cmd 309 with Control set to zero.

Note: this sequence assumes that no test was active when issuing the command in part (a). If a test is active it may be cancelled at any time by issuing this command with Control set to zero as in part (c).

-5- Miscellaneous

This command should only be run when the system is in the IDLE state. It is disruptive to normal system operation.