Appendix A

Input Extension Protocol Encoding

Syntactic Conventions

All numbers are in decimal, unless prefixed with #x, in which case they are in hexadecimal (base 16).

The general syntax used to describe requests, replies, errors, events, and compound types is:

```
NameofThing
  encode-form
  ...
  encode-form
```

Each encode-form describes a single component.

For components described in the protocol as:

```
name: TYPE
```

the encode-form is:

```
N        TYPE    name
```

N is the number of bytes occupied in the data stream, and TYPE is the interpretation of those bytes. For example,

```
depth: CARD8
```

becomes:

```
1        CARD8   depth
```

For components with a static numeric value the encode-form is:

```
N        value   name
```

The value is always interpreted as an N-byte unsigned integer. For example, the first two bytes of a Window error are always zero (indicating an error in general) and three (indicating the Window error in particular):

```
1        0       Error
1        3       code
```

For components described in the protocol as:

name: **{Name1, ..., NameI}**

the encode-form is:

```
N                name
         value1 Name1
         ...
         valueI NameI
```

The value is always interpreted as an N-byte unsigned integer. Note that the size of N is sometimes larger than that strictly required to encode the values. For example:

class: **{InputOutput, InputOnly, CopyFromParent}**

becomes:

```
2                        class
         0       CopyFromParent
         1       InputOutput
         2       InputOnly
```

For components described in the protocol as:

NAME: TYPE or **Alternative1 ... or AlternativeI**

the encode-form is:

N	TYPE		NAME
	value1	Alternative1	
	...		
	valueI	AlternativeI	

The alternative values are guaranteed not to conflict with the encoding of TYPE. For example:

destination: WINDOW or **PointerWindow** or **InputFocus**

becomes:

4	WINDOW		destination
	0	PointerWindow	
	1	InputFocus	

For components described in the protocol as:

value-mask: BITMASK

the encode-form is:

N	BITMASK		value-mask
	mask1	mask-name1	
	...		
	maskI	mask-nameI	

The individual bits in the mask are specified and named, and N is 2 or 4. The most-significant bit in a BITMASK is reserved for use in defining chained (multiword) bitmasks, as extensions augment existing core requests. The precise interpretation of this bit is not yet defined here, although a probable mechanism is that a 1-bit indicates that another N bytes of bitmask follows, with bits within the overall mask still interpreted from least-significant to most-significant with an N-byte unit, with N-byte units interpreted in stream order, and with the overall mask being byte-swapped in individual N-byte units.

For LISTofVALUE encodings, the request is followed by a section of the form:

VALUEs
 encode-form
 ...
 encode-form

listing an encode-form for each VALUE. The NAME in each encode-form keys to the corresponding BITMASK bit. The encoding of a VALUE always occupies four bytes, but the number of bytes specified in the encoding-form indicates how many of the least-significant bytes are actually used; the remaining bytes are unused and their values do not matter.

In various cases, the number of bytes occupied by a component will be specified by a lowercase single-letter variable name instead of a specific numeric value, and often some other component will have its value specified as a simple numeric expression involving these variables. Components specified with such expressions are always interpreted as unsigned integers. The scope of such variables is always just the enclosing request, reply, error, event, or compound type structure. For example:

2	3+n	request length
4n	LISTofPOINT	points

For unused bytes (the values of the bytes are undefined and do not matter), the encode-form is:

N	unused

If the number of unused bytes is variable, the encode-form typically is:

p	unused, p=pad(E)

where E is some expression, and pad(E) is the number of bytes needed to round E up to a multiple of four.

pad(E) = (4 - (E mod 4)) mod 4

Common Types

LISTofFOO

In this document the LISTof notation strictly means some number of repetitions of the FOO encoding; the actual length of the list is encoded elsewhere.

SETofFOO A set is always represented by a bitmask, with a 1-bit indicating presence in the set.

BITMASK: CARD32

WINDOW: CARD32

BYTE: 8-bit value

INT8: 8-bit signed integer

INT16: 16-bit signed integer

INT32: 32-bit signed integer

CARD8: 8-bit unsigned integer

CARD16: 16-bit unsigned integer

CARD32: 32-bit unsigned integer

TIMESTAMP: CARD32

EVENTCLASS: CARD32

INPUTCLASS

0	KeyClass
1	ButtonClass
2	ValuatorClass
3	FeedbackClass
4	ProximityClass
5	FocusClass
6	OtherClass

INPUTCLASS

0	KbdFeedbackClass
1	PtrFeedbackClass
2	StringFeedbackClass
3	IntegerFeedbackClass
4	LedFeedbackClass
5	BellFeedbackClass

INPUTINFO

0	KEYINFO
1	BUTTONINFO
2	VALUATORINFO

DEVICEMODE

0	Relative
1	Absolute

PROXIMITYSTATE

0	InProximity
1	OutOfProximity

BOOL

0	False
1	True

KEYSYM: CARD32

KEYCODE: CARD8

BUTTON: CARD8

SETofKEYBUTMASK

#x0001	Shift
#x0002	Lock
#x0004	Control
#x0008	Mod1
#x0010	Mod2
#x0020	Mod3
#x0040	Mod4
#x0080	Mod5
#x0100	Button1
#x0200	Button2
#x0400	Button3
#x0800	Button4
#x1000	Button5
#xe000	unused but must be zero

SETofKEYMASK

encodings are the same as for SETofKEYBUTMASK, except with

#xff00	unused but must be zero

STRING8: LISTofCARD8

STR

1	n	length of name in bytes
n	STRING8	name

Errors

Request

1	0	Error
1	1	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Value

1	0	Error
1	2	code
2	CARD16	sequence number
4	<32-bits>	bad value
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Window

1	0	Error
1	3	code
2	CARD16	sequence number
4	CARD32	bad resource id
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Match

1	0	Error
1	8	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Access

1	0	Error
1	10	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Alloc

1	0	Error
1	11	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Name

1	0	Error
1	15	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Device

1	0	Error
1	CARD8	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Event

1	0	Error
1	CARD8	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Mode

1	0	Error
1	CARD8	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Class

1	0	Error
1	CARD8	code
2	CARD16	sequence number
4		unused
2	CARD16	minor opcode
1	CARD8	major opcode
21		unused

Keyboards

KEYCODE values are always greater than 7 (and less than 256).

KEYSYM values with the bit #x10000000 set are reserved as vendor-specific.

The names and encodings of the standard KEYSYM values are contained in appendix F.

Pointers

BUTTON values are numbered starting with one.

Requests

GetExtensionVersion

1	CARD8		input extension opcode
1	1		GetExtensionVersion opcode
2	2+(n+p)/4		request length
2	n		length of name
2			unused
n	STRING8		name
p			unused, p=pad(n)

=>

1	1		Reply
1	1		GetExtensionVersion opcode
2	CARD16		sequence number
4	0		reply length
2	CARD16		major version
2	CARD16		minor version
1	BOOL		present
19			unused

ListInputDevices

1	CARD8		input extension opcode
1	2		ListInputDevices opcode
2	1		request length

=>

1	1		Reply
1	2		ListInputDevices opcode
2	CARD16		sequence number
4	(n+p)/4		reply length
1	CARD8		number of input devices
23			unused
n	LISTofDEVICEINFO		info for each input device
p			unused, p=pad(n)

DEVICEINFO

4	CARD32		device type
1	CARD8		device id
1	CARD8		number of input classes this device reports
1	CARD8		device use
		0	IsXPointer
		1	IsXKeyboard
		2	IsXExtensionDevice
1			unused
n	LISTofINPUTINFO		input info for each input class
m	STR		name
p			unused, p=pad(m)

INPUTINFO KEYINFO or BUTTONINFO or VALUATORINFO

KEYINFO

1	0		class id
1	8		length
1	KEYCODE		minimum keycode
1	KEYCODE		maximum keycode
2	CARD16		number of keys
2			unused

BUTTONINFO

1	1	class id
1	4	length
2	CARD16	number of buttons

VALUATORINFO

1	2	class id
1	8+12n	length
1	n	number of axes
1	SETofDEVICEMODE	mode
4	CARD32	size of motion buffer
12n	LISTofAXISINFO	valuator limits

AXISINFO

4	CARD32	resolution
4	CARD32	minimum value
4	CARD32	maximum value

OpenDevice

1	CARD8	input extension opcode
1	3	OpenDevice opcode
2	2	request length
1	CARD8	device id
3		unused

=>

1	1	Reply
1	3	OpenDevice opcode
2	CARD16	sequence number
4	(n+p)/4	reply length
1	CARD8	number of input classes
23		unused
n	LISTofINPUTCLASSINFO	input class information
p		unused, p=pad(n)

INPUTCLASSINFO

1	CARD8		input class id
	0	KEY	
	1	BUTTON	
	2	VALUATOR	
	3	FEEDBACK	
	4	PROXIMITY	
	5	FOCUS	
	6	OTHER	
1	CARD8		event type base code for this class

CloseDevice

1	CARD8	input extension opcode
1	4	CloseDevice opcode
2	2	request length
1	CARD8	device id
3		unused

SetDeviceMode

1	CARD8	input extension opcode
1	5	SetDeviceMode opcode
2	2	request length
1	CARD8	device id
1	CARD8	mode
2		unused

=>

1	1		Reply
1	5		SetDeviceMode opcode
2	CARD16		sequence number
4	0		reply length
1	CARD8		status
	0		Success
		1	AlreadyGrabbed
	3 + first_error	DeviceBusy	
23			unused

SelectExtensionEvent

1	CARD8		input extension opcode
1	6		SelectExtensionEvent opcode
2	3+n		request length
4	Window		event window
2	CARD16		count
2			unused
4n	LISTofEVENTCLASS		desired events

GetSelectedExtensionEvents

1	CARD8		input extension opcode
1	7		GetSelectedExtensionEvents opcode
2	2		request length
4	Window		event window

=>

1	1		Reply
1	7		GetSelecteExtensionEvents opcode
2	CARD16		sequence number
4	n + m		reply length
2	n		this client count
2	m		all clients count
20			unused
4n	LISTofEVENTCLASS		this client list
4m	LISTofEVENTCLASS		all clients list

ChangeDeviceDontPropagateList

1	CARD8		input extension opcode
1	8		ChangeDeviceDontPropagateList opcode
2	3+n		request length
4	Window		event window
2	n		count of events
1	mode		
	0	AddToList	
	1	DeleteFromList	
1			unused
4n	LISTofEVENTCLASS		desired events

GetDeviceDontPropagateList

1	CARD8		input extension opcode
1	9		GetDeviceDontPropagateList opcode
2	2		request length
4	Window		event window

=>

1	1		Reply
1	9		GetDeviceDontPropagateList opcode
2	CARD16		sequence number
4	n		reply length
2	n		count of events
22			unused
4n	LISTofEVENTCLASS		don’t propagate list

GetDeviceMotionEvents

1	CARD8		input extension opcode
1	10		GetDeviceMotionEvents opcode
2	4		request length
4	TIMESTAMP		start
	0	CurrentTime	
4	TIMESTAMP		stop
	0	CurrentTime	
1	CARD8		device id
3			unused

=>

1	1	Reply
1	10	GetDeviceMotionEvents opcode
2	CARD16	sequence number
4	(m+1)n	reply length
4	n	number of DEVICETIMECOORDs in events
1	m	number of valuators per event
1	CARD8	mode of the device
	0	Absolute
	1	Relative
18		unused
(4m+4)n	LISTofDEVICETIMECOORD	events

DEVICETIMECOORD

4	TIMESTAMP		time
4m	LISTofINT32		valuators

ChangeKeyboardDevice

1	CARD8		input extension opcode
1	11		ChangeKeyboardDevice opcode
2	2		request length
1	CARD8		device id
3			unused

=>

1	1		Reply
1	11		ChangeKeyboardDevice opcode
2	CARD16		sequence number
4	0		reply length
1			status
	0	Success	
	1	AlreadyGrabbed	
	2	DeviceFrozen	
23			unused

ChangePointerDevice

1	CARD8		input extension opcode
1	12		ChangePointerDevice opcode
2	2		request length
1	CARD8		x-axis
1	CARD8		y-axis
1	CARD8		device id
1			unused

=>

1	1		Reply
1	12		ChangePointerDevice opcode
2	CARD16		sequence number
4	0		reply length
1			status
	0	Success	
	1	AlreadyGrabbed	
	2	DeviceFrozen	
23			unused

GrabDevice

1	CARD8		input extension opcode
1	13		GrabDevice opcode
2	5+n		request length
4	WINDOW		grab-window
4	TIMESTAMP		time
	0	CurrentTime	
2	n		count of events
1			this-device-mode
	0	Synchronous	
	1	Asynchronous	
1			other-devices-mode
	0	Synchronous	
	1	Asynchronous	
1	BOOL		owner-events
1	CARD8		device id
2			unused
4n	LISTofEVENTCLASS		event list

=>

1	1		Reply
1	13		GrabDevice opcode
2	CARD16		sequence number
4	0		reply length
1			status
	0	Success	
	1	AlreadyGrabbed	
	2	InvalidTime	
	3	NotViewable	
	4	Frozen	
23			unused

UngrabDevice

1	CARD8		input extension opcode
1	14		UngrabDevice opcode
2	3		request length
4	TIMESTAMP		time
	0	CurrentTime	
1	CARD8		device id
3			unused

GrabDeviceKey

1	CARD8		input extension opcode
1	15		GrabDeviceKey opcode
2	5+n		request length
4	WINDOW		grab-window
2	n		count of events
2	SETofKEYMASK		modifiers
	#x8000	AnyModifier	
1	CARD8		modifier device
	#x0FF	UseXKeyboard	
1	CARD8		grabbed device
1	KEYCODE		key
	0	AnyKey	
1			this-device-mode
	0	Synchronous	
	1	Asynchronous	
1			other-devices-mode
	0	Synchronous	
	1	Asynchronous	
1	BOOL		owner-events
2			unused
4n	LISTofEVENTCLASS		event list

UngrabDeviceKey

1	CARD8		input extension opcode
1	16		UngrabDeviceKey opcode
2	4		request length
4	WINDOW		grab-window
2	SETofKEYMASK		modifiers
	#x8000	AnyModifier	
1	CARD8		modifier device
	#x0FF	UseXKeyboard	
1	KEYCODE		key
	0	AnyKey	
1	CARD8		grabbed device
3			unused

GrabDeviceButton

1	CARD8		input extension opcode
1	17		GrabDeviceButton opcode
2	5+n		request length
4	WINDOW		grab-window
1	CARD8		grabbed device
1	CARD8		modifier device
	#x0FF	UseXKeyboard	
2	n		count of desired events
2	SETofKEYMASK		modifiers
1			this-device-mode
	0	Synchronous	
	1	Asynchronous	
1			other-device-mode
	0	Synchronous	
	1	Asynchronous	
1	BUTTON		button
	0	AnyButton	
1	BOOL		owner-events
	#x8000	AnyModifier	
2			unused
4n	LISTofEVENTCLASS		event list

UngrabDeviceButton

1	CARD8		input extension opcode
1	18		UngrabDeviceButton opcode
2	4		request length
4	WINDOW		grab-window
2	SETofKEYMASK		modifiers
	#x8000	AnyModifier	
1	CARD8		modifier device
	#x0FF	UseXKeyboard	
1	BUTTON		button
	0	AnyButton	
1	CARD8		grabbed device
3			unused

AllowDeviceEvents

1	CARD8		input extension opcode
1	19		AllowDeviceEvents opcode
2	3		request length
4	TIMESTAMP		time
	0	CurrentTime	
1			mode
	0	AsyncThisDevice	
	1	SyncThisDevice	
	2	ReplayThisDevice	
	3	AsyncOtherDevices	
	4	AsyncAll	
	5	SyncAll	
1	CARD8		device id
2			unused

GetDeviceFocus

1	CARD8		input extension opcode
1	20		GetDeviceFocus opcode
2	2		request length
1	CARD8		device
3			unused

=>

1	1		Reply
1	20		GetDeviceFocus opcode
2	CARD16		sequence number
4	0		reply length
4	WINDOW		focus
	0	None	
	1	PointerRoot	
	3	FollowKeyboard	
4	TIMESTAMP	focus time	
1			revert-to
	0	None	
	1	PointerRoot	
	2	Parent	
	3	FollowKeyboard	
15			unused

SetDeviceFocus

1	CARD8		input extension opcode
1	21		SetDeviceFocus opcode
2	4		request length
4	WINDOW		focus
	0	None	
	1	PointerRoot	
	3	FollowKeyboard	
4	TIMESTAMP		time
	0	CurrentTime	
1			revert-to
	0	None	
	1	PointerRoot	
	2	Parent	
	3	FollowKeyboard	
1	CARD8		device
2			unused

GetFeedbackControl

1	CARD8		input extension opcode
1	22		GetFeedbackControl opcode
2	2		request length
1	CARD8		device id
3			unused

=>

1	1		Reply
1	22		GetFeedbackControl opcode
2	CARD16		sequence number
4	m/4		reply length
2	n		number of feedbacks supported
22			unused
m	LISTofFEEDBACKSTATE		feedbacks

FEEDBACKSTATE KBDFEEDBACKSTATE, PTRFEEDBACKSTATE, INTEGERFEEDBACKSTATE, STRINGFEEDBACKSTATE, BELLFEEDBACKSTATE, or LEDFEEDBACKSTATE

KBDFEEDBACKSTATE

1	0		feedback class id
1	CARD8		id of this feedback
2	20		length
2	CARD16		pitch
2	CARD16		duration
4	CARD32		led_mask
4	CARD32		led_values
1			global_auto_repeat
	0	Off	
	1	On	
1	CARD8		click
1	CARD8		percent
1			unused
32	LISTofCARD8	auto_repeats	

PTRFEEDBACKSTATE

1	0		feedback class id
1	CARD8		id of this feedback
2	12		length
2			unused
2	CARD16		acceleration-numerator
2	CARD16		acceleration-denominator
2	CARD16		threshold

INTEGERFEEDBACKSTATE

1	0		feedback class id
1	CARD8		id of this feedback
2	16		length
4	CARD32		resolution
4	INT32		minimum value
4	INT32		maximum value

STRINGFEEDBACKSTATE

1	1		feedback class id
1	CARD8		id of this feedback
2	4n+8		length
2	CARD16		max_symbols
2	n		number of keysyms supported
4n	LISTofKEYSYM		key symbols supported

BELLFEEDBACKSTATE

1	1		feedback class id
1	CARD8		id of this feedback
2	12		length
1	CARD8		percent
3			unused
2	CARD16		pitch
2	CARD16		duration

LEDFEEDBACKSTATE

1	1		feedback class id
1	CARD8		id of this feedback
2	12		length
4	CARD32		led_mask
4	BITMASK		led_values
	#x0001	On	
	#x0002	Off	

ChangeFeedbackControl

1	CARD8		input extension opcode
1	23		ChangeFeedbackControl opcode
2	3+n/4		request length
4	BITMASK		value-mask (has n bits set to 1)
	#x0001	keyclick-percent	
	#x0002	bell-percent	
	#x0004	bell-pitch	
	#x0008	bell-duration	
	#x0010	led	
	#x0020	led-mode	
	#x0040	key	
	#x0080	auto-repeat-mode	
	#x0001	string	
	#x0001	integer	
	#x0001	acceleration-numerator	
	#x0002	acceleration-denominator	
	#x0004	acceleration-threshold	
1	CARD8		device id
1	CARD8		feedback class id
2			unused
n	FEEDBACKCLASS		

FEEDBACKCLASS KBDFEEDBACKCTL, PTRFEEDBACKCTL, INTEGERFEEDBACKCTL, STRINGFEEDBACKCTL, BELLFEEDBACKCTL, or LEDFEEDBACKCTL

KBDFEEDBACKCTL

1	0		feedback class id
1	CARD8		id of this feedback
2	20		length
1	KEYCODE		key
1			auto-repeat-mode
	0	Off	
	1	On	
	2	Default	
1	INT8		key-click-percent
1	INT8		bell-percent
2	INT16		bell-pitch
2	INT16		bell-duration
4	CARD32		led_mask
4	CARD32		led_values

PTRFEEDBACKCTL

1	1		feedback class id
1	CARD8		id of this feedback
2	12		length
2			unused
2	INT16		numerator
2	INT16		denominator
2	INT16		threshold

STRINGCTL

1	2	feedback class id
1	CARD8	id of this feedback
2	4n+8	length
2		unused
2	n	number of keysyms to display
4n	LISTofKEYSYM	list of key symbols to display

INTEGERCTL

1	3	feedback class id
1	CARD8	id of this feedback
2	8	length
4	INT32	integer to display

LEDCTL

1	4		feedback class id
1	CARD8		id of this feedback
2	12		length
4	CARD32		led_mask
4	BITMASK		led_values
	#x0001	On	
	#x0002	Off	

BELLCTL

1	5	feedback class id
1	CARD8	id of this feedback
2	8	length
1	INT8	percent
3		unused
2	INT16	pitch
2	INT16	duration

GetDeviceKeyMapping

1	CARD8	input extension opcode
1	24	GetDeviceKeyMapping opcode
2	2	request length
1	CARD8	device
1	KEYCODE	first-keycode
1	CARD8	count
1		unused

=>

1	1	Reply
1	24	GetDeviceKeyMapping opcode
2	CARD16	sequence number
4	nm	reply length (m = count field from the request)
1	n	keysyms-per-keycode
23		unused
4nm	LISTofKEYSYM	keysyms

ChangeDeviceKeyMapping

1	CARD8	input extension opcode
1	25	ChangeDeviceKeyMapping opcode
2	2+nm	request length
1	CARD8	device
1	KEYCODE	first-keycode
1	m	keysyms-per-keycode
1	n	keycode-count
4nm	LISTofKEYSYM	keysyms

GetDeviceModifierMapping

1	CARD8		input extension opcode
1	26		GetDeviceModifierMapping opcode
2	2		request length
1	CARD8		device
3			unused

=>

1	1		Reply
1	26		GetDeviceModifierMapping opcode
2	CARD16		sequence number
4	2n		reply length
1	n		keycodes-per-modifier
23			unused
8n	LISTofKEYCODE		keycodes

SetDeviceModifierMapping

1	CARD8		input extension opcode
1	27		SetDeviceModifier opcode
2	2+2n		request length
1	CARD8		device
1	n		keycodes-per-modifier
2			unused
8n	LISTofKEYCODE		keycodes

=>

1	1		Reply
1	27		SetDeviceModifierMapping opcode
2	CARD16		sequence number
4	0		reply length
1			status
	0	Success	
	1	Busy	
	2	Failed	
23			unused

GetDeviceButtonMapping

1	CARD8		input extension opcode
1	28		GetDeviceButtonMapping opcode
2	2		request length
1	CARD8		device
3			unused

=>

1	1		Reply
1	28		GetDeviceButtonMapping opcode
2	CARD16		sequence number
4	(n+p)/4		reply length
1	n		number of elements in map list
23			unused
n	LISTofCARD8		map
p			unused, p=pad(n)

SetDeviceButtonMapping

1	CARD8		input extension opcode
1	29		SetDeviceButtonMapping opcode
2	2+(n+p)/4		request length
1	CARD8		device
1	n		length of map
2			unused
n	LISTofCARD8		map
p			unused, p=pad(n)

=>

1	1		Reply
1	29		SetDeviceButtonMapping opcode
2	CARD16		sequence number
4	0		reply length
1			status
	0	Success	
	1	Busy	
23			unused

QueryDeviceState

1	CARD8		input extension opcode
1	30		QueryDeviceState opcode
2	2		request length
1	CARD8		device
3			unused

=>

1	1		Reply
1	30		QueryDeviceState opcode
2	CARD16		sequence number
4	m/4		reply length
1	n		number of input classes
23			unused
m	LISTofINPUTSTATE		

INPUTSTATE KEYSTATE or BUTTONSTATE or VALUATORSTATE

KEYSTATE

1	CARD8		key input class id
1	36		length
1	CARD8		num_keys
1			unused
32	LISTofCARD8		status of keys

BUTTONSTATE

1	CARD8		button input class id
1	36		length
1	CARD8		num_buttons
1			unused
32	LISTofCARD8		status of buttons

VALUATORSTATE

1	CARD8		valuator input class id
1	4n + 4		length
1	n		number of valuators
1			mode
	#x01	DeviceMode (0 = Relative, 1 = Absolute)	
	#x02	ProximityState (0 = InProximity, 1 = OutOfProximity)	
4n	LISTofCARD32		status of valuators

SendExtensionEvent

1	CARD8		input extension opcode
1	31		SendExtensionEvent opcode
2	4 + 8n + m		request length
4	WINDOW		destination
1	CARD8		device
1	BOOL		propagate
2	CARD16		eventclass count
1	CARD8		num_events
3			unused
32n	LISTofEVENTS		events to send
4m	LISTofEVENTCLASS		desired events

DeviceBell

1	CARD8		input extension opcode
1	32		DeviceBell opcode
2	2		request length
1	CARD8		device id
1	CARD8		feedback id
1	CARD8		feedback class
1	INT8		percent

SetDeviceValuators

1	CARD8		input extension opcode
1	33		SetDeviceValuators opcode
2	2 + n		request length
1	CARD8		device id
1	CARD8		first valuator
1	n		number of valuators
1			unused
4n	LISTofINT32	valuator values to set	

=>

1	1		Reply
1	33		SetDeviceValuators opcode
2	CARD16		sequence number
4	0		reply length
1	CARD8		status
	0	Success	
	1	AlreadyGrabbed	
23			unused

GetDeviceControl

1	CARD8		input extension opcode
1	34		GetDeviceControl opcode
2	2		request length
2	CARD16		device control type
1	CARD8		device id
1			unused

=>

1	1		Reply
1	34		GetDeviceControl opcode
2	CARD16		sequence number
4	n/4		reply length
1	CARD8		status
	0		Success
	1		AlreadyGrabbed
	3 + first_error		DeviceBusy
23			unused
n			DEVICESTATE

DEVICESTATE DEVICERESOLUTIONSTATE

DEVICERESOLUTIONSTATE

2	0		control type
2	8 + 12n		length
4	n		num_valuators
4n	LISTOfCARD32	resolution values	
4n	LISTOfCARD32	resolution min_values	
4n	LISTOfCARD32	resolution max_values	

ChangeDeviceControl

1	CARD8	input extension opcode
1	35	ChangeDeviceControl opcode
2	2+n/4	request length
2	CARD16	control type
1	CARD8	device id
1		unused
n		DEVICECONTROL

DEVICECONTROL DEVICERESOLUTIONCTL

DEVICERESOLUTIONCTL

2	1	control type
2	8 + 4n	length
1	CARD8	first_valuator
1	n	num_valuators
2		unused
4n	LISTOfCARD32	resolution values

=>

1	1	Reply
1	35	ChangeDeviceControl opcode
2	CARD16	sequence number
4	0	reply length
1	CARD8	status
	0	Success
	1	AlreadyGrabbed
	3 + first_error	DeviceBusy
23		unused

Events

DeviceKeyPress, DeviceKeyRelease, DeviceButtonPress, DeviceButtonRelease, ProximityIn, ProximityOut, and DeviceStateNotify events may be followed by zero or more DeviceValuator events. DeviceMotionNotify events will be followed by one or more DeviceValuator events.

DeviceValuator

1	CARD8	code
1	CARD8	device id
2	CARD16	sequence number
2	SETofKEYBUTMASK	state
1	n	number of valuators this device reports
1	m	number of first valuator in this event
24	LISTofINT32	valuators

DeviceKeyPress

1	CARD8	code
1	KEYCODE	detail
2	CARD16	sequence number
4	TIMESTAMP	time
4	WINDOW	root
4	WINDOW	event
4	WINDOW	child
	0	None
2	INT16	root-x
2	INT16	root-y
2	INT16	event-x
2	INT16	event-y
2	SETofKEYBUTMASK	state
1	BOOL	same-screen
1	CARD8	device id
	#x80	MORE_EVENTS follow

DeviceKeyRelease

1	CARD8		code
1	KEYCODE		detail
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		root
4	WINDOW		event
4	WINDOW		child
	0	None	
2	INT16		root-x
2	INT16		root-y
2	INT16		event-x
2	INT16		event-y
2	SETofKEYBUTMASK		state
1	BOOL		same-screen
1	CARD8		device id
	#x80		MORE_EVENTS follow

DeviceButtonPress

1	CARD8		code
1	BUTTON		detail
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		root
4	WINDOW		event
4	WINDOW		child
	0	None	
2	INT16		root-x
2	INT16		root-y
2	INT16		event-x
2	INT16		event-y
2	SETofKEYBUTMASK		state
1	BOOL		same-screen
1	CARD8		device id
	#x80		MORE_EVENTS follow

DeviceButtonRelease

1	CARD8		code
1	BUTTON		detail
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		root
4	WINDOW		event
4	WINDOW		child
	0	None	
2	INT16		root-x
2	INT16		root-y
2	INT16		event-x
2	INT16		event-y
2	SETofKEYBUTMASK		state
1	BOOL		same-screen
1	CARD8		device id
	#x80		MORE_EVENTS follow

DeviceMotionNotify

1	CARD8		code
1			detail
	0	Normal	
	1	Hint	
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		root
4	WINDOW		event
4	WINDOW		child
	0	None	
2	INT16		root-x
2	INT16		root-y
2	INT16		event-x
2	INT16		event-y
2	SETofKEYBUTMASK		state
1	BOOL		same-screen
1	CARD8		device id
	#x80		MORE_EVENTS follow

DeviceFocusIn

1	CARD8		code
1			detail
	0	Ancestor	
	1	Virtual	
	2	Inferior	
	3	Nonlinear	
	4	NonlinearVirtual	
	5	Pointer	
	6	PointerRoot	
	7	None	
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		event
1			mode
	0	Normal	
	1	Grab	
	2	Ungrab	
	3	WhileGrabbed	
1	CARD8		device id
18			unused

DeviceFocusOut

1	CARD8		code
1			detail
	0	Ancestor	
	1	Virtual	
	2	Inferior	
	3	Nonlinear	
	4	NonlinearVirtual	
	5	Pointer	
	6	PointerRoot	
	7	None	
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		event
1			mode
	0	Normal	
	1	Grab	
	2	Ungrab	
	3	WhileGrabbed	
1	CARD8		device id
18			unused

ProximityIn

1	CARD8		code
1			unused
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		root
4	WINDOW		event
4	WINDOW		child
	0	None	
2	INT16		root-x
2	INT16		root-y
2	INT16		event-x
2	INT16		event-y
2	SETofKEYBUTMASK		state
1	BOOL		same-screen
1	CARD8		device id
	#x80		MORE_EVENTS follow

ProximityOut

1	CARD8		code
1			unused
2	CARD16		sequence number
4	TIMESTAMP		time
4	WINDOW		root
4	WINDOW		event
4	WINDOW		child
	0	None	
2	INT16		root-x
2	INT16		root-y
2	INT16		event-x
2	INT16		event-y
2	SETofKEYBUTMASK		state
1	BOOL		same-screen
1	CARD8		device id
	#x80		MORE_EVENTS follow

DeviceStateNotify events may be immediately followed by zero or one DeviceKeyStateNotify and/ or zero or more DeviceValuator events.

DeviceStateNotify

1	CARD8		code
1	CARD8		device id
	#x80		MORE_EVENTS follow
2	CARD16		sequence number
4	TIMESTAMP		time
1	CARD8		num_keys
1	CARD8		num_buttons
1	CARD8		num_valuators
1	CARD8		valuator mode and input classes reported
	#x01	reporting keys	
	#x02	reporting buttons	
	#x04	reporting valuators	
	#x40	device mode (0 = Relative, 1 = Absolute)	
	#x80	proximity state (0 = InProximity, 1 = OutOfProximity)	
4	LISTofCARD8		first 32 keys (if reported)
4	LISTofCARD8		first 32 buttons (if reported)
12	LISTofCARD32		first 3 valuators (if reported)

DeviceKeyStateNotify

1	CARD8		code
1	CARD8		device id
	#x80		MORE_EVENTS follow
2	CARD16		sequence number
28	LISTofCARD8		state of keys 33-255

DeviceButtonStateNotify

1	CARD8		code
1	CARD8		device id
	#x80		MORE_EVENTS follow
2	CARD16		sequence number
28	LISTofCARD8		state of buttons 33-255

DeviceValuator

1	CARD8		code
1	CARD8		device id
2	CARD16		sequence number
2	SETofKEYBUTMASK		state
1	n		number of valuators this device reports
1	n		number of first valuator in this event
24	LISTofINT32	valuators	

DeviceMappingNotify

1	CARD8		code
1	CARD8		device id
2	CARD16		sequence number
1			request
	0	MappingModifier	
	1	MappingKeyboard	
	2	MappingPointer	
1	KEYCODE		first-keycode
1	CARD8		count
1			unused
4	TIMESTAMP		time
20			unused

ChangeDeviceNotify

1	CARD8		code
1	CARD8		id of device specified on change request
2	CARD16		sequence number
4	TIMESTAMP		time
1			request
	0	NewPointer	
	1	NewKeyboard	
23			unused

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