

Sony Amplifier/Receiver

RS-232C Control Protocol Specification

1. Introduction

This specification describes the RS232C communication protocol between an Amplifier and a Host Controller.

2. Outline

From the system controller, a command is transmitted to the Amplifier from the Host Controller, and the Amplifier / Receiver. A received command changes an internal state according to the contents of the message, or answers the Host Controllers requested Status.

3. Communication format

It is Based on RS-232C format.

Baud Rate : 9600bps
Data Bits : 8bit
Parity : No
Stop Bits : 1

4. Regulation on communication

- Amplifier must return a message of less than 500m sec on reception of a command from Host Controller.
- Host Controller must not transmit the following command, before receiving the reply from the Amplifier to a transmitting command.
- Host Controller must not open 10 or more m seconds of sending-out intervals of each byte in a transmitting message.
- As long as there is no request from Host Controller, even if Amplifier changes internal status etc., it must not transmit a message to Host Controller.

5. Data Format (Host Controller <-> Amplifier)

STX + BC + PDC + CMD + Data1 + ----- + DataN + CS

The terminological definition is as follows.

STX 02 H : Start of text code

BC : Byte Count
(Number of bytes of until before CS from PDC.)

PDC : Product Code

CMD : Command (Opcode)

DataN : Data Block (0 < M + FAH)

CS : Check Sum
A value from which 8 bits of low ranks of the sum
from BC to CS are set to 0.

As an exception,

ACK 0xFD H
NACK 0xFE H

are defined as a 1byte reply message from Amplifier, and it is used when the value of CMD in the command transmitted from Host Controller is 0x00 to 0x7f.

If a reply from the Amplifier is other than ACK/NACK

It assumes that a request is answered in the form of the specified protocol and the details are the specifications of each category.

When a command cannot be executed, or when there is no function to a command, it assumes that the following 4-byte command request has been answered.

NO-EXECUTABLE STX + BC + xxH(PDC) + 0E H
NO-FUNCTION STX + BC + xxH(PDC) + 0F H

NO-EXECUTABLE is answered, when as follows.

Although OPECODE(CMD) is understood,

- The contents of an argument have mistaken.
- Amplifier does not correspond to the contents of an argument.
- A command cannot be executed in the present state.

NO-FUNCTION is answered when Amplifier cannot recognize a command on an OPECODE(CMD) level.

6. About the specifications of each category

The contents from PDC to DATAN are described on the specifications of each category.

STX + BC + PDC + CMD + Data1 + ----- + DataN + CS
|-----|

7. Operation in POWER OFF.

When amplifier is powered off, only the following commands can be received.

- Amplifier Category - POWER ON Command
- Amplifier Category - STATUS REQUEST Command

About the command of others from Host Controller, amplifier answers NACK.

Product Code List

CODE	..	CODE	..	CODE	..	CODE	..
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42		0x82		0xc2	
0x03		0x43		0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07		0x47		0x87		0xc7	
0x08		0x48		0x88		0xc8	
0x09		0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b		0x4b		0x8b		0xcb	
0x0c		0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e		0x4e		0x8e		0xce	
0x0f		0x4f		0x8f		0xcf	
0x10		0x50		0x90		0xd0	
0x11		0x51		0x91		0xd1	
0x12		0x52		0x92		0xd2	
0x13		0x53		0x93		0xd3	
0x14		0x54		0x94		0xd4	
0x15		0x55		0x95		0xd5	
0x16		0x56		0x96		0xd6	
0x17		0x57		0x97		0xd7	
0x18		0x58		0x98		0xd8	
0x19		0x59		0x99		0xd9	
0x1a		0x5a		0x9a		0xda	
0x1b		0x5b		0x9b		0xdb	
0x1c		0x5c		0x9c		0xdc	
0x1d		0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f		0x5f		0x9f		0xdf	
0x20		0x60		0xa0	AMP Req	0xe0	
0x21		0x61		0xa1	AUDIO TUNER Req	0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3	SOUND ADAPTOR Req	0xe3	
0x24		0x64		0xa4		0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8	AMP Response	0xe8	
0x29		0x69		0xa9	AUDIO TUNER Response	0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab	SOUND ADAPTOR Response	0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f		0xbf		0xff	

Sony Amplifier/Receiver Amp Category

RS-232C Control Protocol Specification

AMP Command List (0xA0**)

CODE	Name	CODE	Name	CODE	Name	CODE	Name
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42	INPUT_SELECT	0x82	STATUS_REQ	0xc2	
0x03		0x43	12V_TRIGGER_SET	0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07		0x47		0x87		0xc7	
0x08		0x48		0x88		0xc8	
0x09		0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b		0x4b		0x8b		0xcb	
0x0c		0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e		0x4e		0x8e		0xce	
0x0f		0x4f		0x8f		0xcf	
0x10		0x50		0x90		0xd0	
0x11		0x51		0x91		0xd1	
0x12		0x52	VOLUME_SET	0x92	VOLUME_STATUS_REQ	0xd2	
0x13		0x53	MUTE_SET	0x93		0xd3	
0x14		0x54		0x94		0xd4	
0x15		0x55		0x95		0xd5	
0x16		0x56		0x96		0xd6	
0x17		0x57		0x97		0xd7	
0x18		0x58		0x98		0xd8	
0x19		0x59		0x99		0xd9	
0x1a		0x5a		0x9a		0xda	
0x1b		0x5b		0x9b		0xdb	
0x1c		0x5c		0x9c		0xdc	
0x1d		0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f		0x5f		0x9f		0xdf	
0x20	POWER_OFF	0x60	POWER_SET	0xa0		0xe0	
0x21	POWER_ON	0x61		0xa1		0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3		0xe3	
0x24		0x64		0xa4		0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8		0xe8	
0x29		0x69		0xa9		0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab		0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f	forbidden	0xbf		0xff	

Amp Status List (0xA8**)

CODE	Name	CODE	Name	CODE	Name	CODE	Name
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42		0x82	STATUS_DATA	0xc2	
0x03		0x43		0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07		0x47		0x87		0xc7	
0x08		0x48		0x88		0xc8	
0x09		0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b		0x4b		0x8b		0xcb	
0x0c		0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e	NO-EXECUTABLE	0x4e		0x8e		0xce	
0x0f	NO-FUNCTION	0x4f		0x8f		0xcf	
0x10		0x50		0x90		0xd0	
0x11		0x51		0x91		0xd1	
0x12		0x52		0x92	VOLUME_STATUS_DATA	0xd2	
0x13		0x53		0x93		0xd3	
0x14		0x54		0x94		0xd4	
0x15		0x55		0x95		0xd5	
0x16		0x56		0x96		0xd6	
0x17		0x57		0x97		0xd7	
0x18		0x58		0x98		0xd8	
0x19		0x59		0x99		0xd9	
0x1a		0x5a		0x9a		0xda	
0x1b		0x5b		0x9b		0xdb	
0x1c		0x5c		0x9c		0xdc	
0x1d		0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f		0x5f		0x9f		0xdf	
0x20		0x60		0xa0		0xe0	
0x21		0x61		0xa1		0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3		0xe3	
0x24		0x64		0xa4		0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8		0xe8	
0x29		0x69		0xa9		0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab		0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f		0xbf		0xff	

Amplifier answers ACK/NACK to the following Command.

0x20	POWER_OFF
0x21	POWER_ON
0x42	INPUT_SELECT
0x43	12V_TRIGGER_SET
0x52	VOLUME_SET
0x53	MUTE_SET
0x60	POWER_SET

com ex.)

Host -> AMP 02 02 A0 21 3D

Power ON

AMP -> HOST 0xFD

ACK

0xFE

NACK

Category	0xa0	AMP_REQ	
CODE:	0x82	StatusReq	
function:	Status Request		
format:	0xa0	0x82	ZONE
	Opecode		Operand

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	ZONE	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03.0xff: reserved							

Category	0xa8	AMP_ANSWER	
CODE:	0x82	Status_Data	
function:	Status Data		

format:	0xa8	0x82	ZONE	AUDIO FUNCTION	VIDEO FUNCTION	DATA1
	Opecode		Operand			

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Zone	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03.0xff: reserved							
	AUDIO FUNCTION	1	audio function data							
	VIDEO FUNCTION	1	video function data							
	DATA1	1	0x00 fixed (reserved)		A1 Auto function	Sleep	OSD	Headphone	Mute	Power
	DATA2 12V Trigger Data	1	Channel8	Channel7	Channel6	Channel5	Channel4	Channel3	Channel2	Channel1
			0:off 1:on	0:off 1:on	0:off 1:on	0:off 1:on	0:off 1:on	0:off 1:on	0:off 1:on	0:off 1:on

Trigger	
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Com Example	Request: 0x02 0x03 0xa0 0x82 0x00 0xdb length=6 (main room status) Response: 0x02 0x07 0xa8 0x82 0x00 0x10 0x10 0x01 0x00 0xb1 length=10 (main room VIDEO1, power on)
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Notes	As for Status of 2nd room or 3rd room, DATA2 and following data in DATA1 A1 auto function Sleep OSD HeadPhone becomes 0 fixation.
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Category	0xa0	AMP_REQ		
CODE:	0x92	VolumeStatusReq		
function:	Volume Status Request			
format:	0xa0	0x92	ZONE	ATTRIBUTE
	Opecode		Operand	

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	ZONE	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03.0xff: reserved							
	VOL ATTRIBUTE	1	0x01: current 0x00,0x02.0xff: reserved							

Category	0xa8	AMP_ANSWER
CODE:	0x92	VolumeStatusData
function:	Volume Status Data	

format:	0xa8	0x92	ZONE	ATTRIBUTE	Step_High	Step_Low
	Opecode		Operand			

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Zone	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03.0xff: reserved							
	VOL ATTRIBUTE	1	0x01: current 0x00,0x02.0xff: reserved							
	VOL Step_High	2	volume_upper_data							
	VOL Step_Low		volume_lower_data							

Trigger	
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Com Example	Request: 0x02 0x04 0xa0 0x92 0x010x01 0xc8 length=7 (2nd room , current volume status req) Response: 0x02 0x06 0xa8 0x92 0x01 0x01 0xa6 0x00 0x18 length=9 (2nd room vol=-90.0 dB)
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Notes	
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Category	0xa0	AMP REQ	
CODE:	0x42	Input Select	
function:	Input Selection		
format:	0xa0	0x42	ZONE
	Opecode		Operand

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	ZONE	1	0x00:main, 0x01:2nd, 0x02:3rd, 0x03. reserved							
	AUDIO FUNCTION	1	audio function data							

Trigger			
Com. ex.	Request: 0x02 0x04 0xa0 0x42 0x01 0x10 0x09	length=7	(2nd Zone, VIDEO1)
	Response: 0xfd	length=1	(ack)
Notes			

Category	0xa0	AMP REQ
CODE:	0x53	MuteSet
Function:	Mute Control	

format:	0xa0	0x53	ZONE	Mute
	Opcode		Operand	

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	ZONE	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03: 0xff: reserved							
	Mute Control	1	0x00: MUTE OFF 0x01: MUTE ON 0x02: 0xff: reserved							

Trigger	
Com Example	Request: 0x02 0x04 0xa0 0x53 0x01 0x01 0x07 length=7 (2nd room mute on) Response: 0xfd length=1 (ack)
Notes	

Category	0xa0	AMP REQ	
CODE:	0x60	PowerSet	
Function:	Power Control		
format:	0xa0	0x60	Control
	Opcode		Operand

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	ZONE	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03: 0xff: reserved							
	Control	1	0x00: POWER OFF 0x01: POWER ON 0x02: 0xff: reserved							

Trigger	
Com Example	Request: 0x02 0x04 0xa0 0x60 0x00 0x010xfb length=7 (main room power on) Response: 0xfd length=1 (ack)
Notes	You can use also power command (opcode=0x20,0x21) for main room power control.

Category	0xa0	AMP_REQ
CODE:	0x52	VolumeSet
Function:	Volume Control	

format:	0xa0	0x52	ZONE	Vol Attribute	Step_High	Step_Low
	Opecode		Operand			

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	ZONE	1	0x00: main room 0x01: 2nd room 0x02: 3rd room 0x03: 0xff: reserved							
	VOL ATTRIBUTE	1	0x01: current (direct value setting) 0x02: move (step move) 0x00,0x03: 0xff:reserved							
	VOL Step_High	2	volume_upper_data							
	VOL Step_Low		volume_lower_data							

Trigger	
com example	<p>Request: 0x02 0x06 0xa0 0x52 0x00 0x01 0xa6 0x00 0x61 length=9 (main room current -90dB)</p> <p>Response: 0xfd length=1 (ack)</p> <p>Request: 0x02 0x06 0xa0 0x52 0x00 0x02 0x00 0x01 0x05 length=9 (main room move +1step)</p> <p>Response: 0xfd length=1 (ack)</p>
Notes	<p>When Volume controls using the attribute of Move(STEP), the change speed of Volume influences the time interval of the Volume command which HOST sends repeatedly.</p> <p>If a time interval is short, the change speed of Volume will become quick, and if a time interval excels, the change speed of Volume will become slow.</p>

Category	0xa0	AMP_REQ
CODE:	0x43	12V Trigger
function:	12V Trigger Control	

format:	0xa0	0x43	Channel	control
	Opcode		Operand	

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Channel	1	0x00: channel 1 0x01: channel 2 .. 0x07: channel 8 0x08: 0xff: Reserved							
	Control	1	0x00:OFF 0x01:ON							

Trigger	
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Com ex.	Request: 0x02 0x04 0xa0 0x43 0x01 0x01 0x17 length=7 (channel1 +12V Irriger ON) Response: 0xfd length=1 (ack)
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Notes	
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AUDIO FUNCTION	VIDEO FUNCTION
00 : TUNER	00~ffreserved
01 : PHONO	
02 : CD	
03 : DAT	
04 : MD	
05 : TAPE1	
06 : TAPE2	
07 : DIGITAL1	
08 : DIGITAL2	
09 : DIGITAL3	
0a : AUX1	
0b : AUX2	
0c : MD-WM	
0d : MD2	
0e : MS	
0f : SOURCE	
10 : VIDEO1	10 : VIDEO1
11 : VIDEO2	11 : VIDEO2
12 : VIDEO3	12 : VIDEO3
13 : VIDEO4	13 : VIDEO4
14 : VIDEO5	14 : VIDEO5
15 : LD	10 : LD
16 : TV	16 : TV
17 : DSS	17 : DSS
18 : VCD	18 : VCD
19 : DVD	19 : DVD
1a~1f : reserved	1a~1f : reserved
20 : 5.1INPUT	FE : NO SELECT
21~ff reserved	FF : reserved

Volume_Data for each attribute			
upper	lower	value	
		current	move
0x7f	0xff	invalid	Invalid
0x7f	0xfe	32766/256 dB	32766
0x7f	0xfd	32765/256 dB	32765
0x01	0x00	256/256 dB	256
0x00	0x02	2/256 dB	2
0x00	0x01	1/256 dB	1
0x00	0x00	0 dB	0
0xff	0xff	-1/256 dB	-1
0xff	0xfe	-2/256 dB	-2
			...
0xff	0x00	-256/256 dB	-256
			...
0x80	0x02	-32766/256 dB	-32766
0x80	0x01	-32767/256 dB	-32767
0x80	0x00	-8 dB	Reserved

Category	0xa8	AMP_ANSWER
CODE:	0x0e	No- Executable
function:	amplifier can not execute	

format:	0xa8	0x0e
	Opcode	

Trigger	<p>Although amplifier understood OPCODE(CMD), but</p> <ul style="list-style-type: none"> -the contents of an argument are mistaken. -amplifier does not correspond to the contents of an argument. -a command cannot be executed in the present state.
Com Example	Response: 0x02 0x02 0xa8 0x0e 0x48 length=5
Notes	

Category	0xa8	AMP_ANSWER
CODE:	0x0f	No- Function
function:	amplifier can not execute	

format:	0xa8	0x0f
	Opcode	

Trigger	Amplifier cannot recognize a command on an OPCODE(CMD) level.
Com Example	Response: 0x02 0x02 0xa8 0x 0f 0x47 length=5
Notes	

Sony Amplifier/Receiver Sound Adaptor Category

RS-232C Control Protocol Specification

SOUND Adaptor Command List (0xA3**)

CODE	Name	CODE	Name	CODE	Name	CODE	Name
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42	SF_SELECT	0x82	SF_STATUS_REQ	0xc2	
0x03		0x43		0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07		0x47		0x87		0xc7	
0x08	sf_mode-1	0x48		0x88		0xc8	
0x09	sf_mode+1	0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b		0x4b		0x8b		0xcb	
0x0c		0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e		0x4e		0x8e		0xce	
0x0f		0x4f		0x8f		0xcf	
0x10	AUTO_DECODE	0x50		0x90		0xd0	
0x11	2CH_STEREO	0x51		0x91		0xd1	
0x12	ANALOG_DIRECT	0x52		0x92		0xd2	
0x13	MULTI1_DIRECT	0x53		0x93		0xd3	
0x14	MULTI2_DIRECT	0x54		0x94		0xd4	
0x15		0x55		0x95		0xd5	
0x16		0x56		0x96		0xd6	
0x17		0x57		0x97		0xd7	
0x18		0x58		0x98		0xd8	
0x19		0x59		0x99		0xd9	
0x1a		0x5a		0x9a		0xda	
0x1b		0x5b		0x9b		0xdb	
0x1c		0x5c		0x9c		0xdc	
0x1d		0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f		0x5f		0x9f		0xdf	
0x20		0x60		0xa0		0xe0	
0x21		0x61		0xa1		0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3		0xe3	
0x24		0x64		0xa4		0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8		0xe8	
0x29		0x69		0xa9		0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab		0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f		0xbf		0xff	

Sound Adaptor Status List (0x/

CODE	Name	CODE	Name	CODE	Name	CODE	Name
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42		0x82	SF_STATUS_DATA	0xc2	
0x03		0x43		0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07		0x47		0x87		0xc7	
0x08		0x48		0x88		0xc8	
0x09		0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b		0x4b		0x8b		0xcb	
0x0c		0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e	NO-EXECUTABLE	0x4e		0x8e		0xce	
0x0f	NO-FUNCTION	0x4f		0x8f		0xcf	
0x10		0x50		0x90		0xd0	
0x11		0x51		0x91		0xd1	
0x12		0x52		0x92		0xd2	
0x13		0x53		0x93		0xd3	
0x14		0x54		0x94		0xd4	
0x15		0x55		0x95		0xd5	
0x16		0x56		0x96		0xd6	
0x17		0x57		0x97		0xd7	
0x18		0x58		0x98		0xd8	
0x19		0x59		0x99		0xd9	
0x1a		0x5a		0x9a		0xda	
0x1b		0x5b		0x9b		0xdb	
0x1c		0x5c		0x9c		0xdc	
0x1d		0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f		0x5f		0x9f		0xdf	
0x20		0x60		0xa0		0xe0	
0x21		0x61		0xa1		0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3		0xe3	
0x24		0x64		0xa4		0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8		0xe8	
0x29		0x69		0xa9		0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab		0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f		0xbf		0xff	

Amplifier answers ACK/NACK to the following Command.

0x08	sf_mode-1
0x09	sf_mode+1
0x10	auto decode
0x11	2CH STEREO
0x12	ANALOG DIRECT
0x13	MULTI1 DIRECT
0x14	MULTI2 DIRECT
0x42	SF_SELECT

ex)

Host -> AMP	02 02 A3 08 53	sf mode -1
AMP -> HOST	0xFD	ACK
	0xFE	NACK

Category	0xa3	SoundAdaptor REQ
CODE:	0x82	SF Status Req
function:	Sound Field Status Request	
format:	0xa3	0x82
	Opcode	

Category	0xab	Sound Adaptor REQ		
CODE:	0x82	SF StatusData		
function.	Sound Filed Status Data			
format.	0xab	0x82	SURR PRESET No	Data1
	Opcode		Operand	

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	SURR PRESET No.	1	Sound Field Mode No. 0x00: Surround Off(2ch) 0x01.0x7f: Surround Mode 0x80: Headphone Surround Off 0x81.0xff: Headphone Surround Mode							
	DATA1	1	0x00 fixed (reserved)							SF Lock 0:off 1:on
Trigger										
Com Example	Request: 0x02 0x02 0xa3 0x82 0xd9 length=5 (SF Status Request) Response: 0x02 0x04 0xab 0x82 0x05 0x01 0xc9 length=7 (CINEMA STUDIO EX.B, SF Lock is ON)									
Notes										

Category	0xa3	SoundAdaptor REQ
CODE:	0x42	SF Select
function:	Sound Field Select	

format:	0xa3	0x42	Sound Field No.
	Opcode		Operand

	Operand	Length	Contents
			bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0
	Sound Filed No.	1	Sound Field No. 0x00: Surround Off(2ch) 0x01,0x7f: Surround Mode 0x80: Headphone Surround Off 0x81,0xff: Headphone Surround Mode
Trigger			
Com Example	Request: 0x02 0x03 0xa3 0x42 0x03 0x15 length=6 (select normal surround) Response: 0xfd length=1 (ack)		
Notes			

Category	0xab	Sound Adaptor Answer
CODE:	0x0e	No- Executable
function:	amplifier can not execute	

format:	0xa8	0x0e
	Opcode	

Trigger	<p>Although amplifier understood OPCODE(CMD), but</p> <ul style="list-style-type: none"> -the contents of an argument have mistaken. -amplifier does not correspond to the contents of an argument. -a command cannot be executed in the present state.
Com Example	Response: 0x02 0x02 0xab 0x0e 0x45 length=5
Notes	

Category	0xab	Sound Adaptor Answer
CODE:	0x0f	No- Function
function:	amplifier can not execute	

format:	0xa8	0x0f
	Opcode	

Trigger	Amplifier cannot recognize a command on an OPCODE(CMD) level.
Com Example	Response: 0x02 0x02 0xab 0x0f 0x44 length=5
Notes	

		The sound field table classified by each model			
		STR-DA7ES(UC)	STR-DA4ES(UC)	STR-VA333ES	STR-VZ555ES(J)
SOUND Field No. :	0x00 : 2CH STEREO(SURROUND OFF)	○	○	○	○
	0x01 : AUTO FORMAT DECODE (Auto Decoding)	○	○	○	○
	0x02 : ANALOG DIRECT	○	○	○	○
	0x03 : NORMAL SURROUND	○	○	○	○
	0x04 : CINEMA STUDIO EX.A	○	○	○	○
	0x05 : CINEMA STUDIO EX.B	○	○	○	○
	0x06 : CINEMA STUDIO EX.C	○	○	○	○
	0x07 : SEMI-CINEMA STUDIO EX.A				
	0x08 : SEMI-CINAMA STUDIO EX.B				
	0x09 : SEMI-CINEMA STUDIO EX.C				
	0x0A : NIGHT THEATER				
	0x0B : MONO MOVIE	○	○	○	○
	0x0C : STEREO MOVIE	○	○	○	○
	0x0D : HEADPHONE THEATER				
	0x0E : VIRTUAL MULTI DIMENSION				
	0x0F : VIRTUAL MULTI REAR				
	0x10 : VIRTUAL SEMI MULTI DIMENSION				
	0x11 : VIRTUAL ENHANCED SURROUND A				
	0x12 : VIRTUAL ENHANCED SURROUND B				
	0x13 : SMALL HALL				
	0x14 : LARGE HALL				
	0x15 : OPERA HOUSE	○	○	○	○
	0x16 : JAZZ CLUB	○	○	○	○
	0x17 : DISCO / CLUB	○	○	○	○
	0x18 : CHURCH	○	○	○	○
	0x19 : LIVE HOUSE (Live Concert)	○	○	○	○
	0x1A : ARENA	○	○	○	○
	0x1B : STADIUM	○	○	○	○
	0x1C : GAME	○	○	○	○
	0x1D : VIRTUAL MATRIX 6.1CH				
	0x1E : CONCERT HALL A (Digital Concert Hall A)	○	○	○	○
	0x1F : CONCERT HALL B (Digital Concert Hall B)	○	○	○	○
0x20~0x7E : reserved					
0x7F : SPECIAL(PCM96K)					
0x80 : HEADPHONE 2CH	X	X	X	X	
0x81: reserved					
0x82 : HEADPHONE DIRECT	X	X	X	X	
0x83 : HEADPHONE THEAR(1)	X	X	X	X	
0x84~0xFE : reserved					
0xFF : HEADPHONE SPECIAL					
Notes	<p>Keep in mind that the display turn of a name changes with Receiver(s). Please design after checking the specification of Receiver.</p> <p>○. You can use, when headphone is NOT connected X. You can use, when headphone is connected</p>				

Sony Amplifier/Receiver Audio Tuner Category

RS-232C Control Protocol Specification

Audio Tuner Command List (0xA1**)

CODE	Name	CODE	Name	CODE	Name	CODE	Name
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42	PRESET_SELECT	0x82	STATUS_REQ	0xc2	
0x03		0x43		0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07	AUTO_TUNING+ (Scan)	0x47		0x87		0xc7	
0x08	AUTO_TUNING- (Scan)	0x48		0x88		0xc8	
0x09	AUTO_TUNING.STOP (Scan Stop)	0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b	PRESET+ (Channel+)	0x4b		0x8b		0xcb	
0x0c	PRESET- (Channel-)	0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e		0x4e		0x8e		0xce	
0x0f		0x4f		0x8f		0xcf	
0x10	key_0	0x50		0x90		0xd0	
0x11	key_1	0x51		0x91		0xd1	
0x12	key_2	0x52		0x92		0xd2	
0x13	key_3	0x53		0x93		0xd3	
0x14	key_4	0x54		0x94		0xd4	
0x15	key_5	0x55		0x95		0xd5	
0x16	key_6	0x56		0x96		0xd6	
0x17	key_7	0x57		0x97		0xd7	
0x18	key_8	0x58		0x98		0xd8	
0x19	key_9	0x59		0x99		0xd9	
0x1a	key_shiftL_a	0x5a		0x9a		0xda	
0x1b	key_shiftL_b	0x5b		0x9b		0xdb	
0x1c	key_shiftL_c	0x5c		0x9c		0xdc	
0x1d	key_direct	0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f	am	0x5f		0x9f		0xdf	
0x20	fm	0x60		0xa0		0xe0	
0x21		0x61		0xa1		0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3	PRESET_DATA_REQ	0xe3	
0x24		0x64		0xa4	PRESET_NAME_REQ	0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8		0xe8	
0x29		0x69		0xa9		0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab		0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f		0xbf		0xff	

Audio Tuner Status List (0xA9**)

CODE	Name	CODE	Name	CODE	Name	CODE	Name
0x00		0x40		0x80		0xc0	
0x01		0x41		0x81		0xc1	
0x02		0x42		0x82	STATUS_DATA	0xc2	
0x03		0x43		0x83		0xc3	
0x04		0x44		0x84		0xc4	
0x05		0x45		0x85		0xc5	
0x06		0x46		0x86		0xc6	
0x07		0x47		0x87		0xc7	
0x08		0x48		0x88		0xc8	
0x09		0x49		0x89		0xc9	
0x0a		0x4a		0x8a		0xca	
0x0b		0x4b		0x8b		0xcb	
0x0c		0x4c		0x8c		0xcc	
0x0d		0x4d		0x8d		0xcd	
0x0e	NO-EXECUTABLE	0x4e		0x8e		0xce	
0x0f	NO-FUNCTION	0x4f		0x8f		0xcf	
0x10		0x50		0x90		0xd0	
0x11		0x51		0x91		0xd1	
0x12		0x52		0x92		0xd2	
0x13		0x53		0x93		0xd3	
0x14		0x54		0x94		0xd4	
0x15		0x55		0x95		0xd5	
0x16		0x56		0x96		0xd6	
0x17		0x57		0x97		0xd7	
0x18		0x58		0x98		0xd8	
0x19		0x59		0x99		0xd9	
0x1a		0x5a		0x9a		0xda	
0x1b		0x5b		0x9b		0xdb	
0x1c		0x5c		0x9c		0xdc	
0x1d		0x5d		0x9d		0xdd	
0x1e		0x5e		0x9e		0xde	
0x1f		0x5f		0x9f		0xdf	
0x20		0x60		0xa0		0xe0	
0x21		0x61		0xa1		0xe1	
0x22		0x62		0xa2		0xe2	
0x23		0x63		0xa3	PRESET_DATA	0xe3	
0x24		0x64		0xa4	PRESET_NAME_DATA	0xe4	
0x25		0x65		0xa5		0xe5	
0x26		0x66		0xa6		0xe6	
0x27		0x67		0xa7		0xe7	
0x28		0x68		0xa8		0xe8	
0x29		0x69		0xa9		0xe9	
0x2a		0x6a		0xaa		0xea	
0x2b		0x6b		0xab		0xeb	
0x2c		0x6c		0xac		0xec	
0x2d		0x6d		0xad		0xed	
0x2e		0x6e		0xae		0xee	
0x2f		0x6f		0xaf		0xef	
0x30		0x70		0xb0		0xf0	
0x31		0x71		0xb1		0xf1	
0x32		0x72		0xb2		0xf2	
0x33		0x73		0xb3		0xf3	
0x34		0x74		0xb4		0xf4	
0x35		0x75		0xb5		0xf5	
0x36		0x76		0xb6		0xf6	
0x37		0x77		0xb7		0xf7	
0x38		0x78		0xb8		0xf8	
0x39		0x79		0xb9		0xf9	
0x3a		0x7a		0xba		0xfa	
0x3b		0x7b		0xbb		0xfb	
0x3c		0x7c		0xbc		0xfc	
0x3d		0x7d		0xbd		0xfd	
0x3e		0x7e		0xbe		0xfe	
0x3f		0x7f		0xbf		0xff	

Amplifier answers ACK/NACK to the following Command.

0x05	manual_tuning+
0x06	manual_tuning-
0x07	AUTO.TUNING+ (Scan)
0x08	AUTO.TUNING- (Scan)
0x09	AUTO.TUNING_STOP (Scan Stop)
0x0b	PRESET+ (Channel+)
0x0c	PRESET- (Channel-)
0x10	key_0
0x11	key_1
0x12	key_2
0x13	key_3
0x14	key_4
0x15	key_5
0x16	key_6
0x17	key_7
0x18	key_8
0x19	key_9
0x1a	key_shift_a
0x1b	key_shift_b
0x1c	key_shift_c
0x1d	key_direct
0x1f	am
0x20	fm
0x42	<u>PRESET_SELECT</u>

ex)

Host -> AMP	02 02 A1 1F 3E	BAND AM
AMP -> HOST	0xFD	ACK
	0xFE	NACK

Category	0xa1	TUNER_REQ
CODE:	0x82	StatusReq
function:	TUNER Status	
format:	0xa1	0x82
	Opcode	

Category	0xa9	TunerStatusData
CODE:	0x82	StatusData
function	TUNER Status Data	

format	0xa9	0x82	PRESET Data	PRESET No.	Status/BAND	Frequency
	Opcode		Operand			

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	PRESET Data.	1	PRESET_DATA							
	PRESET No.	1	0x00: forbidden 0x01~0xFF: PRESET No. 0xFF: except PRESET No.							
	STATUS/BAND	1	Momo 0:OFF 1:ON	Tuning Status 0: Not Tuned 1: Tuned	TUNING Mode 00: NORMAL 01: during tuning- 10: during tuning+ 11: reserved	RDS Station 0:not RDS station 1:RDS station	BAND 000:FM 001:AM 010:LW 011:MW 100:SW 101:TV 110~ reserved			
	Frequency	2	Direct Frequency Value (unsigned HEX) FM (x 0.01MHz) AM (x 1KHz)							

Notes	
Trigger	
Com Example	Request: 0x02 0x02 0xa1 0x82 0xdb Response: 0x02 0x07 0xa9 0x82 0x01 0x02 0x00 0x20 0x3a 0x71 (preset A-2,tuned, normal, FM 82.5MHz)

Category	0xa1	TUNER_REQ	
CODE:	0xa3	PresetDataReq	
function:	tuner PRESET data Request		
format:	0xa1	0xa3	PRESET Data Preset No.
	Opcode		Operand

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	PRESET Data.		PRESET_DATA							
	PRESET No.	1	0x00: forbidden 0x01~0xFF: PRESET No. 0xFF: except PRESET No.							

Category	0xa9	TunerStatusData	
CODE:	0xa3	PresetData	
function	Tuner Preset Data		

format	0xa9	0xa3	PRESET Data	PRESET No.	Status/BAND	Frequency
	Opcode		Operand			

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	PRESET Data.	1	PRESET_DATA							
	PRESET No.	1	0x00: forbidden 0x01~0xFF: PRESET No. 0xFF: except PRESET No.							
	STATUS/BAND	1	0000:fix				RDS Station 0: not RDS station 1: RDS	BAND 000:FM 001:AM 010:LW 011:MW 100:SW 101:TV 110~ reserved		
	Frequency	2	Direct Frequency Value (unsigned HEX) FM (x 0.01MHz) AM (x 1KHz)							

Notes	
trigger	
com ex	Request: 0x02 0x04 0xa1 0xa3 0x01 0x02 0xb5 (PRRSET=A2 status req) Response: 0x02 0x07 0xa9 0xa3 0x01 0x02 0x00 0x20 0x3a 0x50 (preset A-2,tuned, normal, FM 82.5MHz)

Category	0xa1	TUNER_REQ	
CODE:	0x42	Preset Select	
function:	PRESET Select		
format:	0xa1	0x42	PRESET Data
	Opcode		Operand
			PresetNo.

	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	PRESET Data.	1	PRESET_DATA							
	PRESET No.	1	0x00: forbidden 0x01~0xFF: PRESET No. 0xFF: except PRESET No.							
trigger										
com ex.	Request: 0x02 0x04 0xa1 0x42 0x01 0x02 0x16 (PRRSET-A2) Response: 0xfd (ack)									
notes										

Category	0xa1	TUNER_REQ								
CODE:	0xa4	PresetNameReq								
function:										
format:	0xa1	0xa4	PRESET Data	Preset No.						
	Opecode		Operand							
	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	PRESET Data.	1	PRESET_DATA							
	PRESET No.	1	0x00: forbidden 0x01~0xFF: PRESET No. 0xFF: except PRESET No.							

Category	0xa9	TunerStatusData								
CODE:	0xa4	PresetNameData								
function										
format	0xa9	0xa4	PRESET Data	PRESET No.	Character					
	Opecode		Operand							
	Operand	Length	Contents							
			bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	PRESET Data.	1	PRESET_DATA							
	PRESET No.	1	0x00: forbidden 0x01~0xFF: PRESET No. 0xFF: except PRESET No.							
	Character Data	1~n	ISO8859 Data x n byte (n <= 20) (The last character byte should be fill uped with 0x00.)							
trigger										
com ex.	Request: 0x02 0x04 0xa1 0xa4 0x01 0x02 0xb4 (PRRSET-A2 name req) Response: 0x02 0x0C 0xA9 0xA4 0x010x02 0x4E 0x45 0x57 0x59 0x4F 0x52 0x4B 0x00 0x75 (PRESET A-2 name = NEWYORK)									
notes										

Category	0xa9	AMP ANSWER
CODE:	0x0e	No- Executable
function:	amplifier can not execute	

format:	0xa9	0x0e
	Opecode	

trigger	<p>Although amplifier understood OPECODE(CMD), but</p> <ul style="list-style-type: none"> -the contents of an argument have mistaken. -amplifier does not correspond to the contents of an argument. -a command cannot be executed in the present state.
com ex.	Response: 0x02 0x02 0xa9 0x0e 0x47 length=5
notes	

Category	0xa9	AMP ANSWER
CODE:	0x0f	No- Function
function:	amplifier can not execute	

format:	0xa9	0x0f
	Opecode	

trigger	Amplifier cannot recognize a command on an OPECODE(CMD) level.
com ex.	Response: 0x02 0x02 0xa9 0x0f 0x46 length=5
notes	

	Length	Contents							
		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
PRESET Data:	1byte	BANK type 0000: SHIFT 1000: BAND				BANK type = SHIFT (SHIFT_DATA)			
						BANK Type = BAND (BAND_DATA)			

0000 :
0001: A
0010: B
0011: C
~
1111: P

0000 :FM
0001: AM
0010: LW
0011: MW
0100: SW
0101: TV
0110: UKV
0111~: reserved