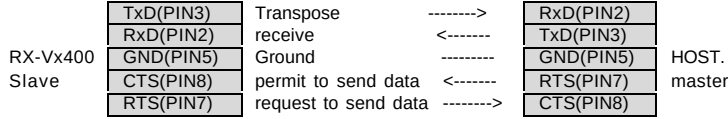


1. Outline

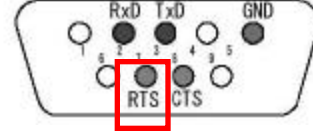
In case no comments in particular as for the contents of this papers, the descriptions are effective for the RX-Vx400. RX-Vx400 in this paper means both RX-V2400 and RX-V1400.

1.1 Connection

5 wire system



*When not connected, data sending to RX-Vx400 is prohibited (CTS port pull down).



1.2 RS-232C Settings

* Full duplex, start-stop synchronization communication

Baud rate : 9600bps

Data bits : 8

Parity : No

Stop bit : 1bit

Handshaking : Hardware

*RTS port of RX-Vx400 outputs low level while the AC plug is disconnected.

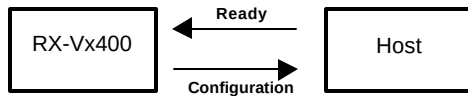
If RTS output stays low even when the AC plug is connected, there might be some trouble.

1.3 Data block timeout

It takes RX-Vx400 maximum 500msec to send one data block. If a complete data block is not received within 500msec, please cancel the transaction. There might be some trouble.

2. Start transactions

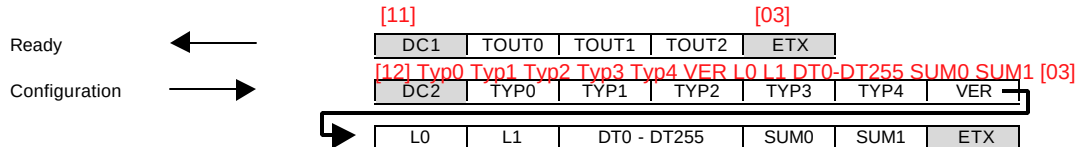
2.1 Starting Communication



Ready command is the very first command to be sent to RX-Vx400 at the start of the communication. TOUT0 - 2 in Ready Command sets timeout of the communication.

RX-Vx400 sends Configuration command (Model ID, software version, and setting data) to the host in reply to the Ready command.

RX-Vx400 will send a Configuration command within 1 sec. after receiving a Ready command from the host. If not, please send a Ready command again (max 5 times). If RX-Vx400 won't send any Configuration commands after fifth retry, please cancel the transaction because there might be some problems.



*TYPx : Model ID = "R0161" (RX-V2400)

*VER : Software Version

*SUM : the sum of all data except for the header and footer

function name	function	data (ASCII)	range (HEX)
TOUT0 - 2	communication timeout	0 - 9, A - F	0 - 0xFFFF

*timeout between the header and the footer

*timeout=0 means no timeout

function name	function	data (ASCII)	range (HEX)
TYP0 - 4	model ID	0 - 9, A - F	voluntary
VER	software version	A - Z	voluntary
L0 - 1	data length	0 - 9, A - F	1 - 0xFF
DT0 - 255	data	0 - 9, A - F	0 - 0xFF
SUM0	upper 4 bit of SUM	0 - 9, A - F	0 - 0xFF
SUM1	lower 4 bit of SUM	0 - 9, A - F	0 - 0xFF

R
0161
09
@E01 9000 0
A
7

*Data Structure of Configuration command

data When the power is OFF, only DT0,1, ...,9 are sent to the Host.			
DT0	Fixed	Baud Rate	Don't care ('@')
DT1	Fixed	Receive Buffer	Don't care ('E')
DT2	Fixed	Receive Buffer	Don't care ('0')
DT3	Fixed	Command Timeout	Don't care ('1')
DT4	Fixed	Command Timeout	Don't care ('9')
DT5	Fixed	Command Timeout	Don't care ('0')
DT6	Fixed	Handshaking	Don't care ('0')
DT7	0 / 1	System	0: OK / 1: Busy 2: Power Off
DT8	0 / 1	Power	0: OFF / 1: ON
DT9	0 - C	Input	0: PHONO / 1: CD / 2: TUNER / 3: CD-R / 4: MD-TAPE / 5: DVD / 6: D-TV-LD / 7: CBL-SAT / 9: VCR1 / A: VCR2-DVR / C: V-AUX
DT10	0 / 1	6ch input	0: OFF / 1: ON
DT11	0 - 6	Input Mode	0: AUTO / 2: DTS / 4: ANALOG / 5: ANALOG ONLY
DT12	0 / 1	Audio Mute	0: OFF / 1: ON
DT13	0 - C	Zone2 Input	0: PHONO / 1: CD / 2: TUNER / 3: CD-R / 4: MD-TAPE / 5: DVD / 6: D-TV-LD / 7: CBL-SAT / 9: VCR1 / A: VCR2-DVR / C: V-AUX
DT14	0 / 1	Zone2 Mute	0: OFF / 1: ON
DT15	0 - F	Master Volume	Upper 4 bit
DT16	0 - F	Master Volume	Lower 4 bit
DT17	0 - F	Zone2 Volume	Upper 4 bit
DT18	0 - F	Zone2 Volume	Lower 4 bit
DT19	0 - F	Program	Upper 4 bit
DT20	0 - F	Program	Lower 4 bit
DT21	0 / 1	Effect	0: OFF / 1: ON
DT22	0 - 3	6.1/ES key status	0: OFF / 1: MATRIX ON / 2: DISCRETE ON / 3: AUTO
DT23	0 - 2	OSD*	0: FULL / 1: SHORT / 2: OFF
DT24	0 - 3	Sleep	0: 120 / 2: 90 / 3: 60 / 4: 30 / 5: OFF
DT25	0 - 4	Tuner Page	0: Page A / 1: Page B / 2: Page C / 3: Page D / 4: PageE
DT26	0 - 7	Tuner No.	0: No.1 / 1: No.2 / 2: No.3 / 3: No.4 / 4: No.5 / 5: No.6 / 6: No.7 / 7: No.8
DT27	0 - 1	Night mode	0: OFF / 1: ON
DT28		Don't Care	
DT29	0 / 1	Speaker relay A	0: OFF / 1: ON
DT30	0 / 1	Speaker relay B	0: OFF / 1: ON
DT31	0 - B	Playback	0: 6ch input / 1: Analog / 2: PCM / 3: DD*(except 2.0) / 4: DD(2.0) / 5: DD.Karaoke / 6: DD.EX / 7: DTS / 8: DTS-ES / 9: Other DIGITAL / A: DTS Analog Mute / B: DTS ES Discrete
DT32	0 - B	Fs	0: Analog / 1: 32kHz / 2: 44.1kHz / 3: 48kHz / 4: 64kHz / 5: 88.2kHz / 6: 96kHz / 7: Unknown B: DTS 96/24
DT33	0 - 2	EX/ES playback	0: OFF / 1: MATRIX ON / 2: DISCRETE ON
DT34	0 / 1	Thr / Bypass	0: Normal / 1: Bypass
DT35	0 / 1	RED dts	0: Release / 1: Wait
DT36	0 / 1	Head Phone	0: OFF / 1: ON
DT37	0 / 1	TUNER BAND	0: FM / 1: AM
DT38	0 / 1	TUNER TUNED	0: NOT TUNED / 1: TUNED
DT39	0 / 1	DC1 Control Out	0: LOW / 1: HIGH
DT40		Don't care	
DT41		Don't Care	
DT42	0-2	DC1 TRG Ctrl.	0: Zone1 / 1: Zone2 / 2: Zone1&2
DT43	0/1	dtS 96/24	0: OFF / 1: ON
DT44	0-2	DC2 TRG Ctrl.	0: Zone1 / 1: Zone2 / 2: Zone1&2
DT45	0/1	DC2 Trigger	0: LOW / 1: HIGH
DT46		SP B set	0: Zone1 / 1: Zone2
DT47		Zone 2 SP out	0: OFF / 1: ON
DT48		MAIN R	Upper 4bit
DT49			Lower 4bit
DT50		MAIN L	Upper 4bit
DT51			Lower 4bit
DT52		CENTER	Upper 4bit
DT53			Lower 4bit
DT54		REAR R	Upper 4bit
DT55			Lower 4bit
DT56		REAR L	Upper 4bit
DT57			Lower 4bit
DT58		SUR BACK	Upper 4bit
DT59		R	Lower 4bit
DT60		SUR BACK	Upper 4bit
DT61		L	Lower 4bit
DT62		FRONT R	Upper 4bit
DT63			Lower 4bit
DT64		FRONT L	Upper 4bit
DT65			Lower 4bit
DT66		SWFR 1	Upper 4bit
DT67			Lower 4bit

DT68	Don't Care		
DT69	Don't Care		
DT70	Don't Care		
DT71	Don't Care		
DT72	Don't Care		
DT73	Don't Care		
DT74	LFE Lvl. SP		Upper 4bit
DT75			Lower 4bit
DT76	LFE Lvl. HP		Upper 4bit
DT77			Lower 4bit
DT78	Audio Delay		Upper 4bit
DT79			Lower 4bit
DT80	Don't Care		
DT81	Don't Care		
DT82	Don't Care		
DT83	Don't Care		
DT84	Input mode set		0: AUTO / 1: LAST
DT85	Dimmer		0: -4 / 1: -3 / 2: -2 / 3: -1 / 4: 0
DT86	OSD Message		
DT87	OSD shift		Upper 4bit
DT88			Lower 4bit
DT89	Glary back		0: OFF / 1: AUTO
DT90	Video conversion		0: OFF / 1: ON
DT91	D. Range	SP	0: MAX / 1: STD / 2: MIN
DT92		HP	0: MAX / 1: STD / 2: MIN
DT93	Zone 2 vol. Out		
DT94	Don't Care		
DT95	Memory guard		0: OFF / 1: ON
DT96	SP set	Center	0: Large / 1: Small / 2: None
DT97		Main	0: Large / 1: Small
DT98		Rear L/R	0: Large / 1: Small / 2: None
DT99		Rear CT	0: Large / 1: Small / 2: None
DT100		Front	0: Yes / 1: None
DT101		LFE/BASS	0: SWFR / 1: Main / 2: Both
DT102	6CH	Center	0: Center / 1: Main
DT103		SWFR	0: SWFR / 1: Main
DT104	Main level		0: Normal / 1: -10dB
DT105	Test mode		0: OFF / 1: Dolby / 2: DTS
DT106			
DT107	LVL 6CH MAIN L		Upper 4bit
DT108			Lower 4bit
DT109	MAIN R		Upper 4bit
DT110			Lower 4bit
DT111	CENTER		Upper 4bit
DT112			Lower 4bit
DT113	SL		Upper 4bit
DT114			Lower 4bit
DT115	SR		Upper 4bit
DT116			Lower 4bit
DT117	SBL		Upper 4bit
DT118			Lower 4bit
DT119	SBR		Upper 4bit
DT120			Lower 4bit
DT121	FORNT L		Upper 4bit
DT122			Lower 4bit
DT123	FRONT R		Upper 4bit
DT124			Lower 4bit
DT125	SWFR		Upper 4bit
DT126			Lower 4bit
DT127	0 - C Z3 Input		
DT128	0/1 Z3 Mute		
DT129	0 - F Z3 Volume		Upper 4bit
DT130	0 - F		Lower 4bit
DT131			
DT132	MULTI_CH SELECT		00: 6CH / 01: 8CH TUNER / 02: 8CH CD / 04: 8CH CD-R / 05: 8CH DVD / 06: DTV / 07: 8CH CBL/SAT / 09: 8CH VCR1 / 0A: VCR2/DVR / 0C: VAUX
DT133	MULTI_CH SURROUND to		00: Surround / 01: Main
DT134	SP SET SW1		00: L-R / 01: F-R / 02: NONE
DT135	SP SET CROSSOVER		00: 40Hz / 01: 60Hz / 02: 80Hz / 03: 90Hz / 04: 100Hz / 05: 110Hz / 06: 120Hz / 07: 160Hz / 08: 200Hz
DT136	COMPONENT OSD		00: OFF / 01: ON
DT137	PB/SB SELECT		00: PR / 01: SB

*DD = Dolby Digital

*OSD = On Screen Display

3. Control Command



*RX-Vx400 can receive control commands only while the power is on.
(Except Power commands and System commands*)

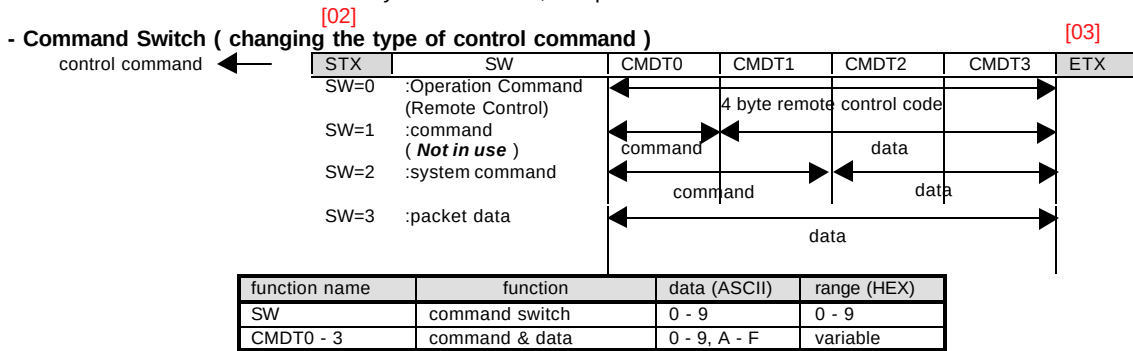
*Please do not send any control commands while the system status is in wait. No commands are permitted until RX-Vx400 reports OK

*RX-Vx400 will send a Report Command** within 1 sec of receiving the Control Command. If no Report Command is received, resend control command (max 5 times) If RX-Vx400 doesn't send a Report Commands after fifth retry, cancel the transaction because there might be some troubles.

*[SW] switches the type of the control command. When the 'SW' is set to '0', you can control RX-Vx400 remotely via RS-232C.

*RX-Vx400 will only send one report command for each type of control. The Report Command will report only the final status of all settings in a strings of commands (may not report all steps in a status, only final status).
For example, if a user set the input selector on the unit to D-TV/LD just after the host sends command to change input to CD, RX-Vx400 may report only the final status that the input was changed to D-TV/LD by the system operation.

*System command, **Report command --> described in later



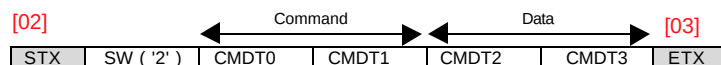
* 'SW' switches the command type of the Control Command.

SW=0 : 4 byte command for remote control code
 SW=1 : 1 byte command 0 - F (HEX expression in ASCII)
 SW=2 : 2 byte command 10 - FF (HEX expression in ASCII)
 SW=3 : 4 byte packet data

* RX-Vx400 uses following three types of Control Command.

- Operation Commands for remote control (SW = 0)
- System Commands for system setting (SW = 2)
- packet data for test data transmission (SW = 3)

3.1 System Command (SW = '2')



System Command can be made by setting the 'SW' byte in the Control Command to '2'. With System command you can control RX-Vx400's system settings (Report Command Enable / Disable, Report Command delay, etc)

With a System Command you can also ...

- set absolute master volume value.
- send text strings to the On Screen Display (OSD).
- request RX-Vx400 text data regarding tuner freq., master volume, input name, zone2 input name.

(from RX-Vx400)

Command				data			Report Command		
SW	CMDT0	CMDT1		CMDT2	CMDT3		Type	RCMD1,2	RDAT1,2
2	0	0	report command enable	0	0	enable	0	00	00(OK)
				0	1	disable	0	00	00(OK)
2	0	1	time between two report commands	0	0	real time	0	00	00(OK)
			(Report Command Delay)	0	1	50ms	0	00	00(OK)
				0	2	100ms	0	00	00(OK)
				0	3	150ms	0	00	00(OK)
				0	4	200ms	0	00	00(OK)
				0	5	250ms	0	00	00(OK)
				0	6	300ms	0	00	00(OK)
				0	7	350ms	0	00	00(OK)
				0	8	400ms	0	00	00(OK)
2	1	0	OSD message start command	0	0	start	0	00	00(OK)
2	2	0	Tuning frequency text request	0	0		Refer to the following section		
			Main volume value text request	0	1				
			Zone2 volume value text request	0	2				
			input name text request	0	3				
			Zone2 input name text request	0	4				
			Zone 2 volume value text request	0	5				
			Zone2 input name text request	0	6				
2	3	0	Master volume direct setting	X	X		0	26	
2	3	1	Zone 2 volume direct setting	X	X		0	27	
2	3	2	Main L/R balance	X	X		0	50	
2	3	3	Main level	0	0	Normal	0	3D	
2	3	4	Zone 3 volume direct setting	X	X				
2	4	0	LEVEL MAIN R	X	X		0	40	
2	4	1	MAIN L	X	X		0	41	
2	4	2	CENTER	X	X		0	42	
2	4	3	REAR R	X	X		0	43	
2	4	4	REAR L	X	X		0	44	
2	4	5	FRONT R	X	X		0	45	
2	4	6	FRONT L	X	X		0	46	
2	4	7	SUR BACK R	X	X		0	47	
2	4	8	SUR BACK L	X	X		0	48	
2	4	9	SWFR 1	X	X		0	49	
2	4	A	SWFR 2	X	X		0	4A	
2	5	0	LFE SP	X	X		0	51	
2	5	1	LFE HP	X	X		0	52	
2	5	2	Audio Delay	X	X		0	53	
2	5	3	SP Delay Center	X	X		0	54	
2	5	4	SP Delay Rear CT	X	X		0	55	
2	6	0	Input Mode	0	0	Auto	0	60	
				0	1	Last	0	60	
2	6	1	Dimmer	X	X		0	61	
2	6	2	OSD Shift	X	X		0	62	
2	6	3	Gray Back	0	0	Off	0	63	
				0	1	Auto	0	63	
2	6	4	Dynamic Range SP	0	0	Max	0	64	
				0	1	STD	0	64	
				0	2	Min	0	64	
2	6	5	Dynamic Range HP	0	0	Max	0	65	
				0	1	STD	0	65	
				0	2	Min	0	65	
2	6	6	Zone 2 Volume Output	0	0	Var.	0	66	
				0	1	Fix	0	66	

2	6	7	Zone 2 Mode	0	0	Mode 1	0	67	
				0	1	Mode 2	0	67	
2	6	8	Memory Guard	0	0	Off	0	68	
				0	1	On	0	68	
2	6	9	Video Conversion	0	0	Off	0	69	
				0	1	On	0	69	
2	6	A	Component OSD	0	0	Off	0	6A	
				0	1	On	0	6A	
2	6	B	Zone 3 Vol output	0	0	Var.	0	6B	
				0	1	Fix	0	6B	
2	7	0	SP Center	0	0	Large	0	70	
				0	1	Small	0	70	
				0	2	None	0	70	
2	7	1	Main	0	0	Large	0	71	
				0	1	Small	0	71	
2	7	2	Rear L/R	0	0	Large	0	72	
				0	1	Small	0	72	
				0	2	None	0	72	
2	7	3	SBACK	0	0	Large x2	0	73	
				0	1	Large x1	0	73	
				0	2	Small x2	0	73	
				0	3	Small x1	0	73	
				0	4	None	0	73	
2	7	4	Front (only V3300)	0	0	Yes	0	74	
				0	1	None	0	74	
2	7	5	LFE/Bass	0	0	SWFR	0	75	
				0	1	Main	0	75	
				0	2	Both	0	75	
2	7	6	SUBWOOFER 1	0	0	L-R	0	76	
				0	1	F-R	0	76	
				0	2	None	0	76	
	7	7	SUBWOOFER 2	0	0	L-R	0	77	
				0	1	F-R	0	77	
				0	2	None	0	77	
2	7	8	6CH Center to	0	0	Center	0	78	
					1	Main	0	78	
2	7	9	6CH SWFR to	0	0	SWFR	0	79	
2	7	A	6CH Surround to	0	0	Surround	0	7A	
					1	Main	0	7A	
2	7	B	Multi CH select	0	0	6CH	0	7B	
				0	1	8CH	0	7B	
2	7	D	PR / SB select	0	0	Sur.Back	0	7D	
				0	1	Presence	0	7D	
2	7	E	Subwoofer Cross Over	0	0	40 Hz	0	7E	
				0	1	60 Hz	0	7E	
				0	2	80 Hz	0	7E	
				0	3	90 Hz	0	7E	
				0	4	100 Hz	0	7E	
				0	5	110 Hz	0	7E	
				0	6	120 Hz	0	7E	
				0	7	160 Hz	0	7E	
				0	8	200 Hz	0	7E	
2	8	0	Test	0	0	Off	0	80	
					1	Dolby	0	80	
					2	DSP	0	80	
2	9	0	6CH Level MAIN R	X	X		0	90	
	9	1	MAIN L	X	X		0	91	
	9	2	CENTER	X	X		0	92	
	9	3	REAR R	X	X		0	93	
	9	4	REAR L	X	X		0	94	
	9	5	FRONT R	X	X		0	95	
	9	6	FRONT L	X	X		0	96	
	9	7	SUR BACK R	X	X		0	97	
	9	8	SUR BACK L	X	X		0	98	
	9	9	SWFR 1	X	X		0	99	
	9	A	SWFR 2	X	X		0	9A	

 : Not supported by RX-Vx400 Series

***OSD message function**

OSD Message function can display a message of 16 characters to Vx300's OSD for a few seconds. The command sequence block will start by sending "start command" as mentioned above, followed by 4 bytes of packet data (SW:3) repeated four times. Then the message of sixteen characters(ASCII) will display and the command block finish automatically.

(ex.)Want to display " Test message ! " characters to OSD.

1. Send the start command.

STX	2	1	0	0	0	ETX
-----	---	---	---	---	---	-----

2. Send SW:3 commands four times as follows.

STX	3	' '	'T'	'e'	's'	ETX
STX	3	't'	' '	'm'	'e'	ETX
STX	3	's'	's'	'a'	'g'	ETX
STX	3	'e'	' '	'!'	' '	ETX

3. The command block will be finished automatically.

The available characters to display the message are as follows.

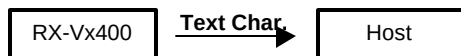
""(SPACE)"!""#""%""&""(')""*""+"" ,"" _
 ""."""0""1""2""3""4""5""6""7""8""9"":""<""=""">""?""A""B""C""D""E""F""G""H""I""J""K""L""M""N""O""P""Q""R""S""T""U""V
 ""W""X""Y""Z""[""]"" _ ""a""b""c""d""e""f""g""h""i""j""k""l""m""n""o""p""q""r""s""t""u""v""w""x""y""z""

***Commands to get the display characters as text data(ASCII)**

This command can get certain of text data(ASCII) from the RX-Vx400 to be used by Host device as follows.

- Tuner frequency characters : " 107.9 "(MHz)
- Master volume value characters : " -99.0dB" / " MUTE"
- Input name : " MY PC " (Even renamed by "SET MENU:INPUT RENAME")
- Zone2 input name : " PS 2 " (Even renamed by "SET MENU:INPUT RENAME")

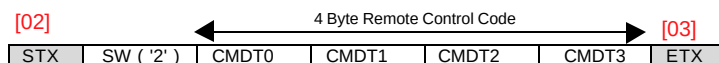
The response protocol for the text request commands are as follows.



RCMD0,1	COMMAND	0 - 9, A - F	0...0xFF
DDAT 0 - 7	DATA	0 - 9, A - Z SP	ASCII char. Space char.
Report Command			

	DC1	RCMD0	RCMD1	DDAT 0	DDAT 1	DDAT 2	DDAT 3	DDAT 4	DDAT 5	DDAT 6	DDAT 7	ETX
Tuner Frequency	DC1	0	0	SP	SP	X	X	X	X	X	X	ETX
Master Volume Value	DC1	0	1	SP	X	X	X	X	X	X	X	ETX
Input Name	DC1	0	3	X	X	X	X	X	X	X	X	ETX
Zone2 Input Name	DC1	0	4	X	X	X	X	X	X	X	X	ETX

3.2 Operation Command (SW = '0')



Operation Command supports all **direct codes** from the standard and extended IR code library for the RX-3200. **No toggle codes** are supported.

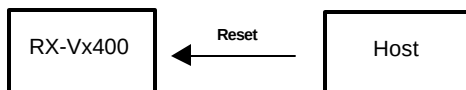
Operation Command							Report Command	
SW	CMDT0	CMDT1	CMDT2	CMDT3	function	setting	Type	RCMD1,2
0	7	A	1	A	master volume	Up	0	26
	7	A	1	B		Down		
	7	E	A	2	Audio Mute	ON		23
	7	E	A	3		OFF		
	7	A	1	4	Input	PHONO		21
	7	A	1	5		CD		
	7	A	1	6		TUNER		
	7	A	1	9		CD-R		
	7	A	C	9		MD/TAPE		
	7	A	C	1		DVD		
	7	A	5	4		D-TV/LD		
	7	A	C	0		CABLE (CBL/SAT)		
	7	A	C	A		SAT		
	7	A	0	F		VCR1		
	7	A	1	3		VCR2/DVR		
	7	A	C	8		VCR3		
	7	A	5	5		V-AUX		
	7	E	A	4	6ch input	ON		
	7	E	A	5		OFF		
	7	E	A	6	Input Mode	AUTO		22
	7	E	A	7		D.D., RF		
	7	E	A	8		DTS		
	7	E	A	9		DIGITAL		
	7	E	A	A		ANALOG		
	7	E	3	B		AAC		
	7	A	D	A	Zone 2 Volume	UP		27
	7	A	D	B		DOWN		
	7	E	A	0	Zone2 mute	ON		25
	7	E	A	1		OFF		
	7	A	D	0	Zone2 Input	PHONO		24
	7	A	D	1		CD		
	7	A	D	2		TUNER		
	7	A	D	4		CD-R		
	7	A	C	F		MD/TAPE		
	7	A	C	D		DVD		
	7	A	D	9		D-TV/LD		
	7	A	C	C		CABLE (CBL/SAT)		
	7	A	C	B		SAT		
	7	A	D	6		VCR1		
	7	A	D	7		VCR2/DVR		
	7	A	C	E		VCR3		
	7	A	D	8		V-AUX		
	7	A	1	D	Power	ON		20
	7	A	1	E		OFF		
	7	E	7	E	Main(Zone1) Power	ON		
	7	E	7	F		OFF		
	7	E	B	A	Zone2 power	ON		
	7	E	B	B		OFF		
	7	A	E	D	Zone 3 Power	ON		27
	7	A	E	E		STANDBY		
	7	E	2	6	Zone 3 Mute	ON		91
	7	E	6	6		OFF		
	7	A	F	D	Zone 3 Vol.	UP		92
	7	A	F	E		DOWN		
	7	A	F	1	Zone 3 Input	PHONO		90
	7	A	F	2		CD		
	7	A	F	3		TUNER		
	7	A	F	5		CD-R		
	7	A	F	4		MD/TAPE		
	7	A	F	C		DVD		
	7	A	F	6		DTV/LD		
	7	A	F	7		CBL/SAT (cable)		
	7	A	F	8		SAT		
	7	A	F	9		VCR1		
	7	A	F	A		VCR2		
	7	A	F	B		DVR		
	7	A	F	0		V-AUX		
	7	E	B	0	On screen(OSD)	OFF		2B
	7	E	B	1		SHORT		
	7	E	B	2		FULL		
	7	E	B	3	Sleep	OFF		2C
	7	E	B	4		120		
	7	E	B	5		90		
	7	E	B	6		60		
	7	E	B	7		30		
	7	E	B	8	EX/ES	ON (MATRIX)		2D
	7	E	B	9		OFF		
	7	E	7	C		AUTO		
	7	E	7	D		DISCRETE		
	7	E	9	B	Night mode	ON		82
	7	E	9	C		OFF		82
	7	E	2	7	Effect	ON		28
	7	E	E	0	Stereo			
	7	E	E	1	DSP Program	Hall A (HALL1)		
	7	E	E	2		Hall B		

7	E	E	3	Hall C		
7	E	E	4	Hall U.S.A.		
7	E	E	5	Hall E		
7	E	E	6	Live Concert (HALL2)		
7	E	E	7	Tokyo		
7	E	E	8	Freiburg (CHURCH)		
7	E	E	9	Royaumont		
7	E	E	A	Village Gate		
7	E	E	B	Village Vanguard		
7	E	E	C	The Bottom Line (JAZZ)		
7	E	E	D	The Roxy Theatre (ROCK)		
7	E	E	E	Warehouse Loft		
7	E	E	F	Arena		
7	E	F	0	Disco		
7	E	F	1	Party		
7	E	F	2	Game		
7	E	F	F	7ch Stereo		
7	E	F	3	Pop/Rock (Music Video)		
7	E	F	4	DJ		
7	E	F	5	Classical/Opera		
7	E	F	6	Pavilion		
7	E	F	7	Mono Movie		
7	E	F	8	Variety Sports		
7	E	F	9	Spectacle		
7	E	F	A	Sci-Fi		
7	E	F	B	Adventure		
7	E	F	C	General		
7	E	F	D	Normal		
7	E	F	E	Enhanced		
7	E	6	7	PLII MOVIE		
7	E	6	8	PLII MUSIC		
7	E	6	9	NEO:6 CINEMA		
7	E	6	A	NEO:6 MUSIC		
7	E	C	1	2CH DIRECT STEREO		
7	E	C	0	2CH STEREO		
7	E	C	2	THX (ULTRA2) CINEMA + PL		
7	E	C	3	THX MUSIC		
7	E	C	7	THX (ULTRA2) CINEMA + PL2		
7	E	C	8	THX (ULTRA2) CINEMA + NEO6		
7	A	E	0	Tuner preset page	A	0 29
7	A	E	1		B	
7	A	E	2		C	
7	A	E	3		D	
7	A	E	4		E	
7	A	E	5	Tuner preset No.	1	2A
7	A	E	6		2	
7	A	E	7		3	
7	A	E	8		4	
7	A	E	9		5	
7	A	E	A		6	
7	A	E	B		7	
7	A	E	C		8	
7	E	B	C	Tuner band	FM	35
7	E	B	D		AM	
7	E	B	E	Auto tuning start	UP	15
7	E	B	F		DOWN	
7	E	A	B	speaker relay A	ON	2E
7	E	A	C		OFF	
7	E	A	D	speaker relay B	ON	2F
7	E	A	E		OFF	
7	E	2	B	Home preset memory	A	
7	E	2	C		B	
7	E	2	D		C	
7	E	2	E		D	
7	E	2	F		E	
7	E	2	0		F	
7	E	3	5	Home preset recall	A	
7	E	3	6		B	
7	E	3	7		C	31
7	E	3	8		D	
7	E	3	9		E	
7	E	3	A		F	
7	E	6	B	Volume preset memory	A	
7	E	6	C		B	
7	E	6	D		C	
7	E	6	E		D	
7	E	6	F		E	
7	E	6	0		F	
7	E	7	5	Volume preset recall	A	
7	E	7	6		B	
7	E	7	7		C	
7	E	7	8		D	
7	E	7	9		E	
7	E	7	A		F	
7	E	8	7	Z2 Vol. Memory	A	
7	E	8	8		B	
7	E	8	9		C	
7	E	8	A		D	
7	E	8	B		E	
7	E	8	C		F	
7	E	8	D	Z2 Vol. Recall	A	
7	E	8	E		B	
7	E	8	F		C	
7	E	9	0		D	
7	E	9	1		E	

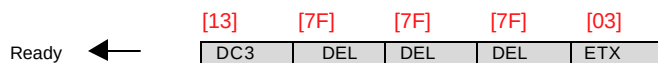
7	E	9	2		F		
7	E	2	0	Z3 Vol. Memory	A		94
7	E	2	1		B		
7	E	2	2		C		
7	E	2	3		D		
7	E	2	4		E		
7	E	2	5		F		
7	E	6	0	Z3 Vol. Recall	A		93
7	E	6	1		B		
7	E	6	2		C		
7	E	6	3		D		
7	E	6	4		E		
7	E	6	5		F		
7	E	3	2	DC1 TRG Control	Zone 1		3A
7	E	3	3		Zone 2		
7	E	3	1		Zone 3		
7	E	7	1	Zone 2 DC1 TRG	On		36
7	E	7	2		Off		
7	E	7	3	Zone 1 DC1 TRG	On		36
7	E	7	4		Off		
7	E	8	3	Zone 3 DC1 TRG	On		36
7	E	8	4		Off		
7	E	9	3	Dual Mono	Main		39
7	E	9	4		Sub		
7	E	9	5		All		
7	E	9	6	DC2 TRG Control	Zone 1		3B
7	E	9	7		Zone 2		
7	E	9	F		Zone 3		
7	E	9	8		Zone OR		
7	E	3	C	Zone 2 DC2 TRG	On		3C
7	E	3	D		Off		
7	E	3	E	Zone 1 DC2 TRG	On		3C
7	E	3	F		Off		
7	E	8	5	Zone 3 DC2 TRG	On		3C
7	E	8	6		Off		
7	E	2	8	SP B SET	Zone 1		3E
7	E	2	9		Zone 2		
7	E	9	9	Zone 2 SP OUT	On		3F (70/73/78)
7	E	9	A		Off		

4. Reset Command

Reset Command recalls factory preset data. Once the factory preset are recalled, all user controllable setting / parameter data will be deleted and replaced with original factory settings.
Please do not use this command unless you have been experiencing problems with the system or if you just want to clean up the system.



After the system is reset, please request the Configuration Command using Ready Command (see section 2) in order to get accurate feedback of status of RX-Vx400 to your touch panel system.



*recall factory preset of all data

5. Report Command

RX-Vx400 will send Report Command in response to Control Commands from the host controller. From Report Command you can receive the current status of the RX-Vx400.



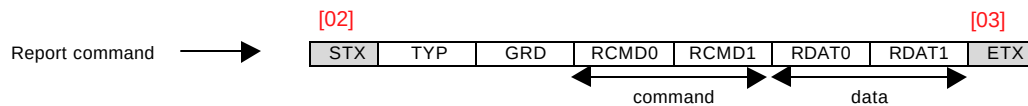
There are three types of Report Command classified by their information type.

- System Status Report : RX-Vx400 reports a System Status Report when the system status changed.
- Playback Status Report : RX-Vx400 reports a Playback Status Report when the internal playback status changed.
- Operation Report : When the RX-Vx400 is controlled by remote controller, front panel, RS-232C or by system controller, RX-Vx400 sends a Operation Report, which includes the latest setting status of the controlled function.

*RX-Vx400 reports a System State Report with system guard to inform its power status (power off) when a control command was sent to RX-Vx400 while it's turned off.

*The guard status is included in the Report Command (GRD). If the control command the host sent was accepted by RX-Vx400, the guard status in the Report Command is '0' (No Guard). On the contrary the guard status will be 'System Guard' or 'Setting Guard' when the command was guarded for some reason (e.g. If you send a 'Speaker A ON' command while you are using a headphone, the guard status will be 'System Guard' because the speaker controls are prohibited by system while a headphone is used.)

*If a status changed multiple times in a certain time, RX-Vx400 report only one report command.



function name	function	data (ASCII)	range (HEX)
TYP	control type	0 - 9	0 - 9
GRD	guard status	0 - 9	0 - 9
RCMD0, 1	command	0 - 9, A - F	0 - 0xFF
RDAT0, 1	data	0 - 9, A - F	0 - 0xFF

<Control type> This indicates for which type of control the report command is.

TYP	control type
0	controlled by RS-232C
1	controlled by remote controller (I/R)
2	controlled by keys in the unit
3	controlled by system
4	controlled by encoder

<Guard status> This indicates guard status against all control command

GRD	Guard status*
0	no guard
1	system guard
2	setting guard

*see the following chart

[02] 3 0 1 5 0 1 [03]

[STX]

Typ: controlled by System

GRD: 0

Tuner Tuned: Tuned

[ETX]

*Factor of the guards and the contents informed in report commands when there are no guards

operation	no guard	system guard	setting guard
Power	Power status	---	---
Input	6ch input/ selected input	---	---
Input mode	selected Input mode	6ch Input is ON during Input Rename function doesn't have the designated Input mode	---
Zone2 Input	selected input	zone2 selector is not at "REMOTE"	---
Mute	mute status	---	---
Zone2 mute	mute status	---	---
master volume	volume value	---	---
Program	Program ID	6ch input is ON source is not 32kHz,44.1kHz or 48kHz	---
6.1/ES Key	status	6ch input is ON Program is OFF	---
Tuner page	page	Tuner function is not active	---
Tuner Preset No.	No.	Tuner function is not active	---
OSD	status	SET MENU is active Test tone is ON	Memory Guard is ON
Sleep	status	Test tone is ON	---
Home	selected Bank	---	---
Home volume	selected Bank	---	---
Speaker A/B	ON/OFF Status	Headphone Mode	---

5.3 Operation Reports

Report Item

Status

[02]

[03]

STX	TYP	GRD	RCMD0	RCMD1	RDAT0	RDAT1	ETX
-----	-----	-----	-------	-------	-------	-------	-----

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
20	Power	00	ALL(Main/Zone2/3) OFF	28	Program	00	Hall A (HALL1)
		01	ALL(Main/Zone2/3) ON			01	Hall B
		02	MainON / Zone2 OFF / Zone3 OFF			02	Hall C
		03	MainOFF / Zone2 ON / Zone3 ON			04	Hall C
			MainON / Zone2 ON / Zone3 OFF			05	Hall E
			MainON / Zone2 OFF / Zone3 OFF			06	Live Concert
			MainOFF / Zone2 ON / Zone3 ON			08	Tokyo
			MainOFF / Zone2 OFF / Zone3 ON			09	Freiburg
21	Input	x,0	PHONO	0A	Royaumont		
		x,1	CD	0C	Village Gate		
		x,2	TUNER	0D	Village Vanguard		
		x,3	CD-R	0E	The Bottom Line		
		x,4	MD/TAPE	10	The Roxy Theater		
		x,5	DVD	11	Warehouse Loft		
		x,6	D-TV/LD	12	Arena		
		x,7	CBL/SAT	14	Disco		
		x,8	SAT	15	Party		
		x,9	VCR1	16	Game		
		x,A	VCR2/DVR	17	6/8CH Stereo		
		x,B	VCR3/DVR	18	Pop/Rock		
		x,C	V-AUX	19	DJ		
		0/1,x	6ch input OFF/ON	1C	Opera		
22	Input mode	00	AUTO	1D	Pavillion		
		02	DTS	20	Mono Movie		
		04	ANALOG	21	Variety Sports		
		05	ANALOG ONLY	24	Spectacre		
		06	AAC	25	Sci-Fi		
		23	Mute	00	OFF	28	Adventure
01	ON			29	General		
24	Zone2 Input	00	PHONO	2C	Normal		
		01	CD	2D	Enhanced		
		02	TUNER	30	PLII Movie		
		03	CD-R	31	PLII Music		
		04	MD/TAPE	32	Neo: 6 Movie		
		05	DVD	33	Neo: 6 Music		
		06	D-TV/LD	36	THX A Cinema		
		07	CBL/SAT	37	THX B Music		
		08	SAT	34	STREO A 2CH Streo		
		09	VCR1	35	STREO B 2CH Direct Streo		
		0A	VCR2/DVR	80-B3	STRAIGHT		
		0B	VCR3/DVR	80	STRAIGHT (HALL A)		
		0C	V-AUX	81	STRAIGHT (HALL B)		
		25	Zone2 Mute	00	OFF	...	
01	ON			B3	STRAIGHT (NEO:6 MUSIC)		
26	Master vol.	00	-∞	29	Tuner Page	00	A
		39	-80dB			01	B
		...				02	C
		C7	0dB			03	D
		...				04	E
		E8	16.5dB				
27	Zone 2 Vol.	00	-∞	2A	No.	00	1
		39	-80dB			01	2
		...				02	3
		C7	0dB			03	4
		...				04	5
		E8	16.5dB			05	6
				06	7		
				07	8		
2B	OSD	00	Full			00	Full
		01	Short			01	Short
		02	Off			02	Off
2C	Sleep	00	120			00	120
		01	90			01	90
		02	60			02	60
		03	30			03	30
		04	Off			04	Off
2D	EX/ES(Key)	00	Off			00	Off
		01	Matrix On			01	Matrix On
		02	Discrete On			02	Discrete On
		03	Auto			03	Auto
2E	SP Relay A	00	Off			00	Off
		01	On			01	On
2F	SP Relay B	00	Off			00	Off
		01	On			01	On

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
30	Home	01	Preset	A	36	DC1 Trigger	00 Off (Due to the delay
		02		B			01 On (Due to the delay
		03		C	37	Home Zone 2 Vol.	Preset
		04		D			A
		05		E			B
		06		F			C
31	Home	01	Memory	A			D
		02		B			E
		03		C			F
		04		D	38	Home Zone 2 Vol.	A
		05		E			B
		06		F			C
32	Home Vol.	01	Preset	A			D
		02		B			E
		03		C			F
		04		D	39	Dual Mono	Main
		05		E			Sub
		06		F			All
33	Home Vol.	01	Memory	A	3A	DC1 Trigger CTRL	00 ALL ZONE OR
		02		B			01 ZONE1
		03		C			02 ZONE2
		04		D			03 ZONE3
		05		E	3B	DC2 Trigger CTRL	00 ALL ZONE OR
		06		F			01 ZONE1
34	Headphone	00	Off				02 ZONE2
		01	On				03 ZONE3
35	FM/AM	00	FM		3C	DC2 Trigger OUTPUT	00 Off (Due to the delay
		01	AM				01 On (Due to the delay
				3D	MAIN	00	Normal
					LEVEL	01	-10dB
				3E	SP B SET	00 01	MAIN ZONE B
				3F	ZONE2 SP OUT	00 01	OFF ON

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
40	LEVEL MAIN R	14	-10dB	46	LEVEL SUR BACK L	14	-10dB
		15				15	
		...				...	
		3C	+10dB			3C	+10dB
41	LEVEL MAIN L	14	-10dB	47	LEVEL FRONT R	14	-10dB
		15				15	
		...				...	
		3C	+10dB			3C	+10dB
42	LEVEL CENTER	14	-10dB	48	LEVEL FRONT L	14	-10dB
		15				15	
		...				...	
		3C	+10dB			3C	+10dB
43	LEVEL REAR R	14	-10dB	49	LEVEL SWFR 1	00	-20dB
		15				01	-19.5dB
		...				...	
		3C	+10dB			28	0dB
44	LEVEL REAR L	14	-10dB	4A	LEVEL SWFR 2	00	-20dB
		15				01	-19.5dB
		...				...	
		3C	+10dB			28	0dB
45	LEVEL SUR BACK R	14	-10dB				
		15					
		...					
		3C	+10dB				

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
50	Main L/R Balance	00	Lch Max	54	SP Delay Center	00	0ms
		...				01	0.5ms
		14	Mid			...	
		...				0A	5ms
51	LFE Level SP	28	Rch Max	55	SP Delay Rear CT	00	0ms
		00	-20dB			01	0.5ms
		01	-19dB			...	
		...				3C	30ms
52	LFE Level HP	14	0dB				
		00	-20dB				
		01	-19dB				
		...					
53	Audio Delay	14	0dB				
		00	0ms				
		01					
		...					
		A0	160ms				

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
60	Input Mode	00 01	Auto Last	63	Gray Back	00 01	Off Auto
61	Dimmer	00 01 02 03 04	-4 -3 -2 -1 0	64	Dynamic Range SP	00 01 02	Max. Std. Min.
62	OSD Shift	00 01 02 03 04 05 06 07 08 09 0A	-5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5	65	Dynamic Range HP	00 01 02	Max. Std. Min.
				66	Zone 2 Vol. out	00 01	Var. Fix
				67	Zone 2 Mode	00 01	Mode 1 Mode 2
				68	MEM Guard	00 01	Off On
				69	Video Conv.	00 01	Off On
				6A	COMP OSD	00 01	Off On
				6B	Zone 3 Vol. out	00 01	Var. Fix

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
70	Center SP	00 01 02	Large Small None	76	SW1	00 01 02	L-R F-R NONE
71	Main	00 01	Large Small	78	6CH Center	00 01	Center Main
72	Rear LR SP	00 01 02	Large Small None	79	6CH SWFR	00 01	SWFR Main
73	SUR BACK	00 01 02 03 04	Large x2 Large x1 Small x2 Small x1 None	7A	6CH SUR	00 01	SURROUND MAIN
74	Front	00 01	Yes None	7B	MULTI CH SELECT	00 01	6CH 8CH
75	LFE Bass Out	00 01 02	SWFR Main Both	7E	SW CROSS OVER	00 01 02 03 04 05 06 07 08	40 Hz 60 Hz 80 Hz 90 Hz 100 Hz 110 Hz 120 Hz 160 Hz 200 Hz

RCMD0, 1	Report Item	RDAT0, 1	Status
80	Test	00 01 02	Off Dolby DSP
81	ANALOG SPECIAL	00 01 02	OFF ON (2ch) ON (Multi)
82	NIGHT MODE	00 01	OFF ON

RCMD0, 1	Report Item	RDAT0, 1	Status	RCMD0, 1	Report Item	RDAT0, 1	Status
90	MULTI CH LEVEL MAIN R	14 15 ...	-10dB	96	MULTI CH LEVEL SUR	14 15 ...	-10dB
(*4)		3C	+10dB	(*4)	BACK L	3C	+10dB
91	MULTI CH MAIN L	14 ...	-10dB	97	MULTI CH LEVEL FRONT R	14 15 ...	-10dB
(*4)		3C	+10dB	(*4)		3C	+10dB
92	MULTI CH LEVEL CENTER	14 15 ...	-10dB	98	MULTI CH FRONT L	14 15 ...	-10dB
(*4)		3C	+10dB	(*4)		3C	+10dB
93	MULTI CH LEVEL REAR R	14 15 ...	-10dB	99	MULTI CH LEVEL SWFR 1	00 01 ...	-20dB -19.5dB
(*4)		3C	+10dB	(*4)		28	0dB
94	MULTI CH LEVEL REAR L	14 15 ...	-10dB	9A	MULTI CH LEVEL SWFR	00 01 ...	-20dB -19.5dB
(*4)		3C	+10dB	(*4)	2	28	0dB
95	MULTI CH LEVEL SURBACK R	14 15 ...	-10dB				
(*4)		3C	+10dB				

Attention

*When the Input is changed, RX-Vx400 sends Operation Report for Input (RCMD0,1="21") and Input mode(RCMD0,1="22").

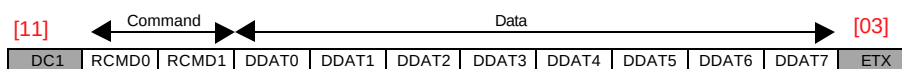
*When the Home bank is changed, RX-Vx400 sends Operation Report for Home bank (RCMD0,1="30") and Configuration Command.

*When a headphone is plugged into the headphone jack and Speaker Relay turned off, RX-Vx400 send the Operation Report for Speaker Relay A and B (RCMD0,1="2E","2F", RDATA="00(OFF)"). RX-Vx400 sends the Operation Command for Speaker Relay A and B when the headphone is removed also.

*Each time the source from the Inputs or playback status (ex. 6.1/ES, RED dts etc.) of the system changes, RX-Vx400 send a Playback Status report.

*Each time the busy status of the system changes, RX-Vx400 send the System Status report.

5.4 Display Text Data Report



OCMD0,1	ITEM	DDAT0,1	DDAT2-7
00	Tuner Frequency	SP	6digits <Upper Lower>

(example)
AM 1710kHz = 'SP' '1' '7' '1' '0'
FM 108.5MHz = 'SP' '1' '0' '8' '5' '0'

OCMD0,1	ITEM	DDAT 0	DDAT1-7
01	Master Volume	SP	5digits <Upper Lower>

(example)
-99dB = 'SP' '-' '9' '9' '0' '0' '0' '0'

OCMD0,1	ITEM	DDAT0-2	DDAT3-7
02	Zone2 Volume	SP 02	3digits <Upper Lower>

DCMD0,1	ITEM	DDAT0-7
03	Input name SP	8letters <Right Left>

(example)
D-TV/LD = 'SP' 'D' 'V' 'L' 'D'

OCMD0, 1	ITEM	DDAT0-7
04	Zone 2 Input name	8letters <Right Left>

FUNCTION	ITEM	DATA (ASCII)	RANGE
RCMD0,1	Command	0-9, A-F	0...0xFF
DDAT 0-7	Data	0-9, A-Z SP, other ASCII	ASCII Space, dots

Example of RX-Vx400 Control Procedure

- [1] Connection Start procedure (AC Plug / RS-232C cable connection)

When the AC plug / RS-232C cable are not connected, RX-Vx400 cannot send any data to host. If the host doesn't receive a configuration command after sending Ready command 5 times, host should disable the RS-232C communication of the host and send alert to the graphic user interface (GUI).

- [2] AC plug / RS-232C connection check sequence after the connection has been confirmed in the procedure [1].

If the host doesn't receive a Report Command within 500ms of sending a command, the host should resend the command. If no Report Command is received after sending 5 times, check AC plug/RS-232 cable (see [1]).

When the RS-232C cable is disconnected, the commands generated inside RX-Vx400 are stored in the sending buffer. If the stored commands exceed the buffer memory size (buffer overflow), RX-Vx400 stops reporting any commands. In this case, reconnecting AC plug or Connection Start procedure [1] will be needed in order to enable the command report.

- [3] AC plug connection detection (after [1],[2])

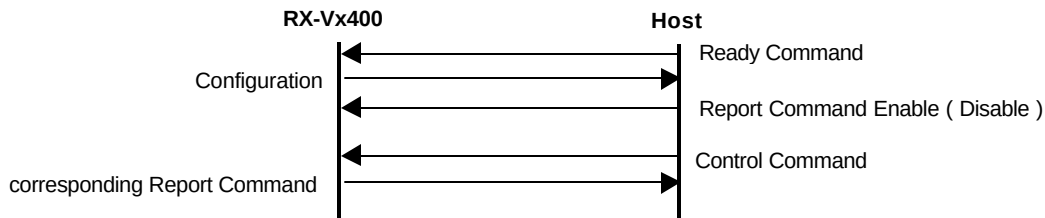
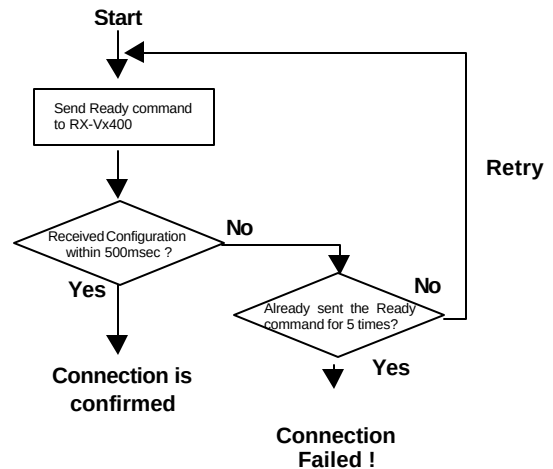
When the AC connection is reset, RX-Vx400 send Configuration Command to the host. Host can feedback the status of RX-Vx400 to its GUI.

- [4] Getting the status of the RX-Vx400 when the host boot up

At first, host should send Ready command and receive the Configuration Command from RX-Vx400 (see [1]).

Once the connection is confirmed, host can send Control Commands to the host. While the RX-Vx400 is turned off, RX-Vx400 only accept System Command and Power ON command.

[1] : AC Plug / RS-232C connection check (Start transaction)



- [5] Error transactions after [4]

While sending control command, if RX-Vx400 didn't send any corresponding Report Commands regardless of re-trying for 5 times, host should clear its send buffer and then check AC plug / RS-232C connection sequence (see [1]). When the RX-Vx400 responded, the host can feedback the RX-Vx400 status to its GUI then return to the normal communication sequence. If not, the host should cancel the communication and report the alert to its GUI.

Appendix

* ASCII Chart

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	EXC	+	;	K	[	k	{
C	FF	FS	,	<	L	¥	l	
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	...
F	SI	US	/	?	O	_	o	DEL

* the column number = the first hexadecimal digit
the row number = the second hexadecimal digit

* The characters in the gray sells are available in the RS-232C communications.