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CC4001

RS-232C Control Specification

Category	:	*CD Changer*
Document Version	:	*1.0*
Author(s)	:	**Marantz America, Inc.**
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Number of Page	:	**14**

Table of Contents

1. Global Description
1-1. Overview
A Host controller can control or watch out the product as a Slave very easily via the communication cable.

1-2. Block Diagram

HOST (Controller)	RS232C cable (straight)	SLAVE (The product) Connector D-SUB (9pin, male)
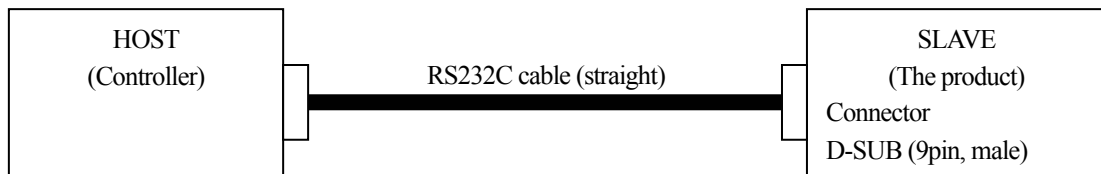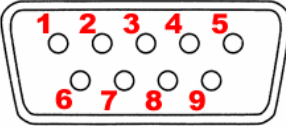
* **The product connector is using D-SUB 9pin male.**
* **RS232C cable must use D-SUB 9pin female to connect the products.**

1-3. Interface connection specification of the product

uP Interface	Signal name	Connection device	D-Sub Pin	Connecter
-	N.C.	-	1	<The product connector> RS232C D-SUB (9pin,**male)**
UART	TxD (output)	RS232C	2	
	RxD (input)	Level shift driver	3	
-	N.C.	-	4	1 2 3 4 5
-	GND	GND	5	
-	N.C.	-	6	6 7 8 9
-	N.C.	-	7	
-	N.C.	-	8	
-	N.C.	-	9	

1-4. Assumptions and Dependencies

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2. Detailed Description

The interface specification between the product and a Host controller is described below.

2-1. Connection format

2-1-1. Physical connection

Host (Controller)   Slave (the product)

(Serial setting <RS232C basic>)
Baud Rate   : 9600bps
Data Bits   : 8bit
Parity   : None
Stop bit   : 1bit
Handshaking   : None
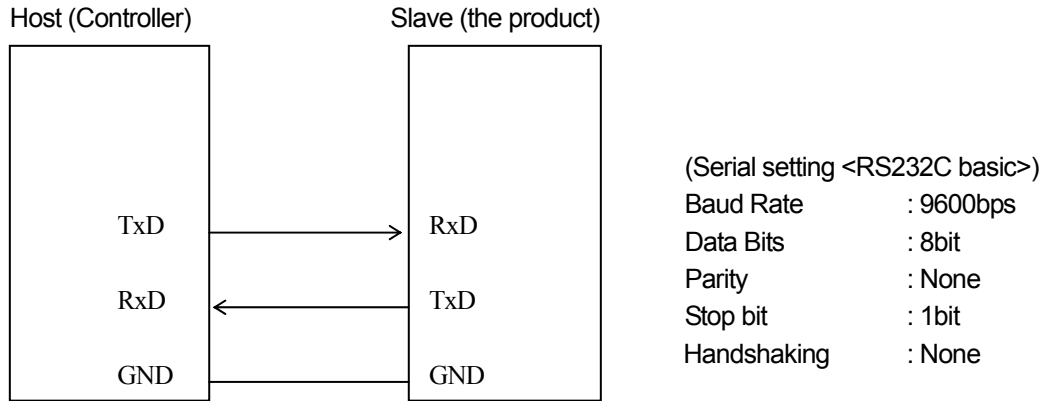
2-1-1-1. Data transmission sequence from Host to Slave

Host (Controller)   Slave (The product)
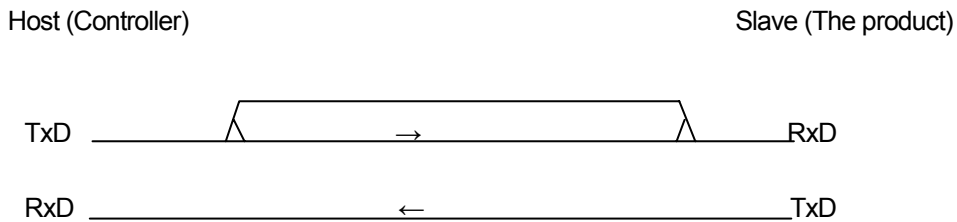
1. Host starts a data transmission from TxD.
2. Host performs the data transmission of the number of required bytes, and ends a transmission.

2-1-1-2. Data transmission sequence from Slave to Host

Host (Controller)   Slave (The product)
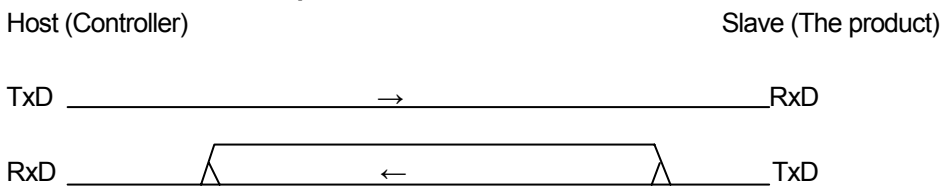
1. Slave starts a data transmission from TxD.
2. Slave performs the data transmission of the number of required bytes, and ends a transmission.

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2-2. Transmission data format

2-2-1. Transmission data format from Host to Slave

There are two kinds of transmission data form from Host shown below.

2-2-1-1. Form1: Command

Command is a data that requests some status change.

Start character   : '@'
COMMAND   : see "Command list"
End character (CR) : 0Dh

Start	Command	End
'@'	"xxx:"+"..."	0Dh

2-2-1-2. Form2: Status request

Status request is a data that requests a answer of some status.

Start character   : '@'
Request status   : see "Status request list"
Request character   : '?'
End character (CR) : 0Dh

Start	Request status	End
'@'	"xxx:?"+"..."	0Dh

2-2-2. Transmission data format from Slave to Host

There are two kinds of transmission data form from Slave shown below.

2-2-2-1. Form1: ACK/NAK

ACK is a reply data from Slave when Slave got an acceptable command data from Host.
(ACK is sent to Host when Slave has no related status by the Command.)

Start character   : '@',   ACK   : 06h,   End character (CR) : 0Dh

start	ACK	CR
'@'	06h	0Dh

NAK is a reply data from Slave when Slave got an incorrect Command data, Status request data or some other data from Host.

Start character   : '@',   NAK   : 15h,   End character (CR) : 0Dh

start	NAK	CR
'@'	15h	0Dh

2-2-2-2. Form2: Status answer and Auto status feedback

Status answers are reply data when Slave got an acceptable Request status or Command data from Host. Auto status feedbacks are sent to Host data when a Slave's status is changed.

Start character   : '@'
Answer character   : see "Status list"
End character (CR) : 0Dh

Start	Status	End
'@'	"xxx:"+"..."	0Dh

2-3. The transaction sequences and the regulations

2-3-1. The transaction sequences

The transactions have three kinds of sequence.

*A transaction is a Command from Host then Slave will be an answer by Status answer, ACK or NAK.

*A transaction is a Status request from Host then Slave will be an answer by Status answer or NAK.

*A transaction is Auto status feedback from Slave when a Slave's status changed. (If the auto status feedback is enabled.)

2-3-2. The transaction regulations
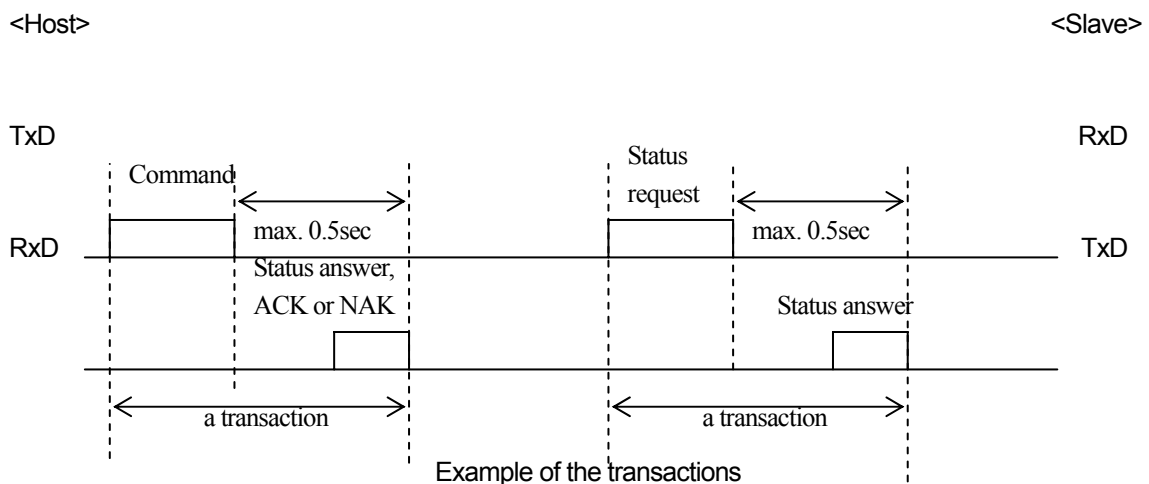
The transactions have some kinds of regulation.

* An answer (ACK, NAK or Status answer) transmittion by Slave has to finish within 500ms when got a Command or a Status request from Host.

 * Host must not transmit an another Command or Status request until "it receives a answer by a previous Command or Status request" or "it passes a term of waitinng time from a finishing of previous transmission of a Command or a Status request ".

* Slave has to finish a transaction under 500ms when it sends Auto status feedback data.

2-3-3. Specification of Auto status feedback

There are some specific regulations about Auto status feedback.

* The product status has segmented into **four layers of 1, 2, 3 and 4**.

* The status of layer 1 are assigned most kindly status to Host. (The statuses of layer 2 are assigned kindly status, the statuses of layer 3 are not so need status to Host and the statuses of layer 4 are probably no wished statuses.)

* Each layer status can control transmit enable or disable by Host command. (The product default would be all disables.)

* Slave sends auto status feedback by itself when the status is changed and if the status feedback is enabled.

* The product defined and segmentationed layers are takeing in status list.

2-3-4. Example of the transactions

<Host>   <Slave>

TxD   RxD

Command   max. 0.5sec   Status request   max. 0.5sec

RxD   TxD

Status answer, ACK or NAK   Status answer

a transaction   a transaction

Example of the transactions

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2-3-5. Examples of the handshaking flowchart

2-3-5-1. Example of successful handshaking
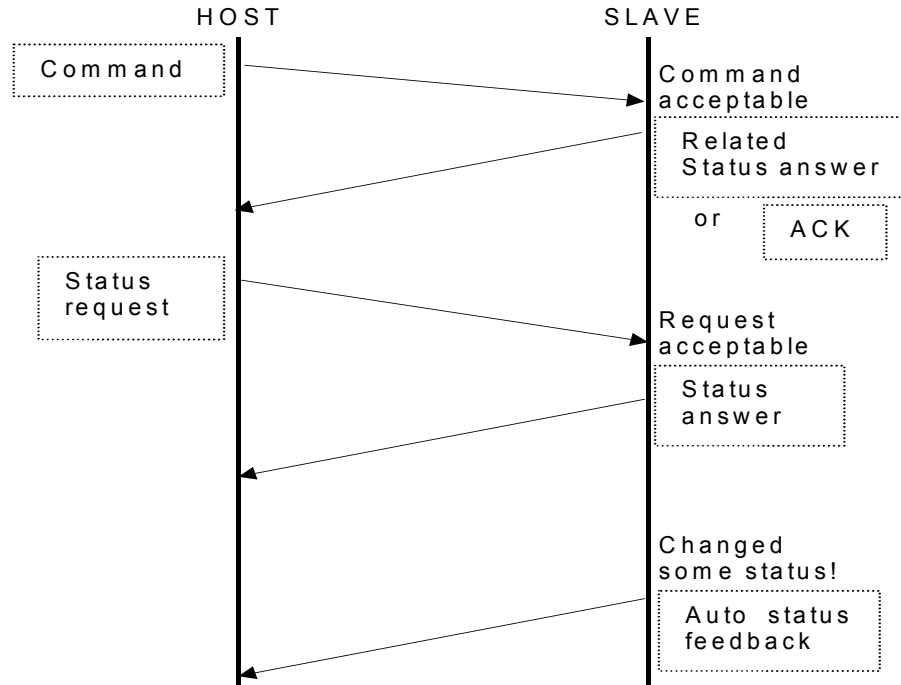
    The product can reply ACK instead of related status, if the product can not send the related status immediatly.

2-3-5-2. Examples of handshaking error
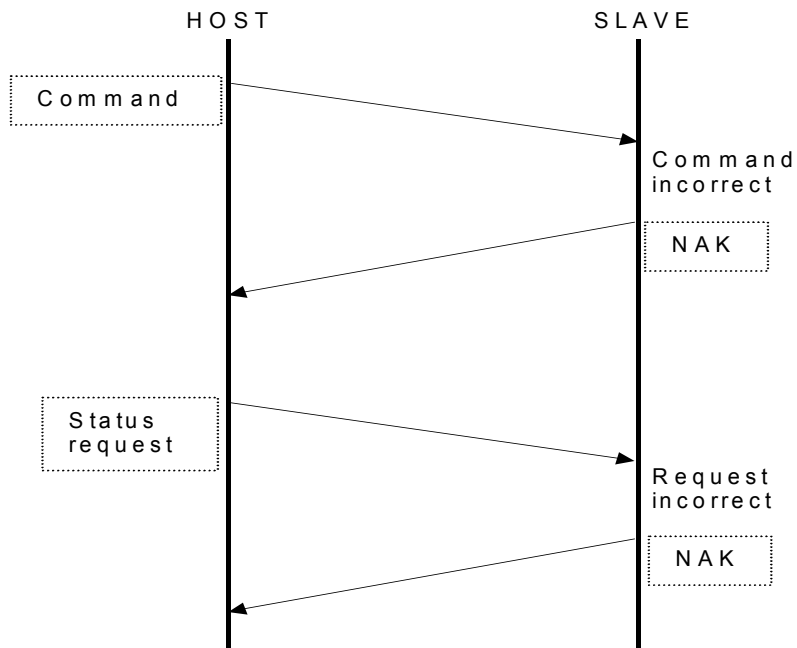
3. Recommendations of Command, Status and Layer definition

- All Commands, Statuses and Layers will be defined other specific document.
- **[MANDATORY]** The product **MUST** have Commands and the Statuses same as a remote controller buttons (IR controller) of the product.
- All Commands are required working by discreate as ON/OFF commands. (It means that do not support TOGGLE command only.)
- All Commands and Statuses are defined same chharacter size except ACK/NAK on the product. (Recommended character length : 3~6 characters)
- It permits attaching 0x0A character to a reply characters from the product. In this case, must suppose that the object is followed altogether.
- Recommend to supports numbers or values direct setting command, if it has variable numbers or values.

4. Definitions of Command, Status and Layer
This section is told how to define "Command", "Status" and "Layer" of this product.

4-1. Commands
This chapter will show the commands of this product.

4-1-1. Normal Command list

	Command		Reply from Slave
POWER	TOGGLE (work on same as RC)	"PWR:0"	"PWR:1" (OFF) "PWR:2" (ON)
	OFF (work on same as RC)	"PWR:1"	
	ON (work on same as RC)	"PWR:2"	
TRAY	TOGGLE (work on same as RC)	"TRY:0"	"TRY:0" (WORKING) "TRY:1" (OPENED) "TRY:2" (CLOSED)
	OPEN	"TRY:1"	
	CLOSE	"TRY:2"	
DISC	-	-	"DSC:0" (WORKING) "DSC:1" (DISC1) "DSC:2" (DISC2) "DSC:3" (DISC3) "DSC:4" (DISC4) "DSC:5" (DISC5)
	DISC1 (work on same as RC)	"DSC:1"	
	DISC2 (work on same as RC)	"DSC:2"	
	DISC3 (work on same as RC)	"DSC:3"	
	DISC4 (work on same as RC)	"DSC:4"	
	DISC5 (work on same as RC)	"DSC:5"	
	DISC Skip + (work on same as RC)	"DSC:6"	
	DISC Skip – (work on same as RC)	"DSC:7"	
TIME MODE	TOGGLE (work on same as RC)	"TMD:0"	"TMD:1" (LAP) "TMD:2" (REMAIN) "TMD:3" (TOTAL REMAIN)
	LAP	"TMD:1"	
	REMAIN	"TMD:2"	
	TOTAL REMAIN	"TMD3"	
DIMMER	TOGGLE (work on same as RC)	"DIM:0"	"DIM:1" (DIMMER OFF) "DIM:2" (DIMMER 1) "DIM:3" (DIMMER 2)
	DIMMER OFF	"DIM:1"	
	DIMMER 1	"DIM:2"	
	DIMMER 2	"DIM:3"	
REPEAT MODE	TOGGLE (work on same as RC)	"REP:0"	"REP:1" (REPEAT OFF) "REP:2" (REPEAT 1) "REP:4" (REPEAT A DISC) "REP:5" (REPEAT ALL DISC)
	REPEAT OFF	"REP:1"	
	REPEAT 1	"REP:2"	
	REPEAT DISC	"REP:4"	
	REPEAT ALL	"REP:5"	

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	Command		Reply from Slave
PLAY MODE	STOP (work on same as RC)	"PMD:1"	"PMD:1" (STOP) "PMD:2" (PAUSE) "PMD:3" (NORMAL PLAY) "PMD:6" (FF) "PMD:7" (REV)
	PAUSE (work on same as RC)	"PMD:2"	
	PLAY (work on same as RC)	"PMD:3"	
	-	-	
	-	-	
	FF	"PMD:6"	
	REV	"PMD:7"	
AMS MODE	TOGGLE (work on same as RC)	"AMS:0"	"AMS:1" (AMS OFF) "AMS:2" (ALL TRACK AMS) "AMS:3" (ALL DISC AMS)
	OFF	"AMS:1"	
	AMS1 (ALL TRACK AMS)	"AMS:2"	
	AMS2 (ALL DISC AMS)	"AMS:3"	
TRACK SEARCH	VALUE	"TRK:0yzzz" (y = DISC NO., zzz = TNO.) (if y = 0, select current disc)	"TRK:yzzz" (y = DISC NO., zzz = TNO.)
GO TO TRACK (NEXT / PREV)	NEXT (work on same as RC)	"GOT:0"	ACK
	PREV (work on same as RC)	"GOT:1"	
RANDOM	TOGGLE (work on same as RC)	"RDM:0"	"RDM:1" (OFF) "RDM:2" (RANDOM 1 DISC) "RDM:4" (RANDOM ALL DISC)
	RANDOM 1 (RANDOM OFF)	"RDM:1"	
	RANDOM 2 (RANDOM 1 DISC)	"RDM:2"	
	RANDOM 4 (RANDOM ALL DISC)	"RDM:4"	
PROGRAM	TOGGLE (work on same as RC)	"PRG:0"	"PRG:1" (ON)
	ON	"PRG:1"	"PRG:2" (OFF)
	OFF	"PRG:2"	"PRG:xxyzzz" (xx = Program No.) (y = DISC NO. zzz = TNO.) (If zzz = ALL, select all track) **(When program is full, xx = "--", y = "-", zzz = "FUL")**
	VALUE	"PRG:3yzzz" (y = DISC NO. zzz = TNO.) (if y = 0, select current disc) (If zzz = ALL, select all track)	
RECALL	RECALL (work on same as RC)	"RCL:0"	"RCL:xxyzzz" xx = Program number y=DISC NO, zzz=TRK No If not programed xyz=0 (When CC4001 displays "END", xx = "--" y = "-" zzz = "END")

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Command			Reply from Slave
Numeric Key [0]	(work on same as RC)	"MUN:0"	ACK
Numeric Key [1]	(work on same as RC)	"NUM:1"	ACK
Numeric Key [2]	(work on same as RC)	"NUM:2"	ACK
Numeric Key [3]	(work on same as RC)	"NUM:3"	ACK
Numeric Key [4]	(work on same as RC)	"NUM:4"	ACK
Numeric Key [5]	(work on same as RC)	"NUM:5"	ACK
Numeric Key [6]	(work on same as RC)	"NUM:6"	ACK
Numeric Key [7]	(work on same as RC)	"NUM:7"	ACK
Numeric Key [8]	(work on same as RC)	"NUM:8"	ACK
Numeric Key [9]	(work on same as RC)	"NUM:9"	ACK

Specific Commands

Command from Host		Reply from Slave
Auto status feedback (The product default is disabled all auto status feedback.)	"AST:x" (x = '0' ~ 'F') bit 3 : Layer 4 (1 = Enable, 0 = Disable) bit 2 : Layer 3 (1 = Enable, 0 = Disable) bit 1 : Layer 2 (1 = Enable, 0 = Disable) bit 0 : Layer 1 (1 = Enable, 0 = Disable)	same as command define (Default value = 0)

4-1-2. Normal Status request and Status (answer and feedback) list

Status request		Status answer and feedback	
POWER	"PWR:?"	OFF	"PWR:1"
		ON	"PWR:2"
TRAY	"TRY:?"	WORKING	"TRY:0"
		OPENED	"TRY:1"
		CLOSED	"TRY:2"
TRAY NUMBER (Tray number that has disc)	"TNO:?"	WORKING	"TNO:0"
		TRAY 1	"TNO:1"
		TRAY 2	"TNO:2"
		TRAY 3	"TNO:3"
		TRAY 4	"TNO:4"
		TRAY 5	"TNO:5"
DISC NUMBER	"DSC:?"	WORKING	"DSC:0"
		DISC 1	"DSC:1"
		DISC 2	"DSC:2"
		DISC 3	"DSC:3"
		DISC 4	"DSC:4"
		DISC 5	"DSC:5"
TIME MODE	"TMD:?"	LAP	"TMD:1"
		REMAIN	"TMD:2"
		TOTAL REMAIN	"TMD:3"
DIMMER	"DIM:?"	DIMMER OFF	"DIM:1"
		DIMMER LEVEL 1	"DIM:2"
		DIMMER LEVEL 2	"DIM:3"
REPEAT	"REP:?"	REPEAT OFF	"REP:1"
		REPEAT 1	"REP:2"
		REPEAT 1 DISC	"REP4"
		REPEAT ALL DISC	"REP:5"
PLAY MODE	"PMD:?"	STOP	"PMD:1"
		PAUSE	"PMD:2"
		NORMAL PLAY	"PMD:3"
		FF	"PMD:6"
		REV	"PMD:7"
AMS MODE	"AMS:?"	AMS OFF	"AMS:1"
		ALL TRACK AMS	"AMS:2"
		ALL DISC AMS	"AMS:3"
PLAY TIME	"TIM:?"	min:sec (xxx = min, yy=sec)	"TIM:xxxyy"
TRACK NUMBER	"TRK:?"	Track number = zzz DISC NO = y	"TRK:yzzz"
ALL TRACK NUMBER (After read TOC, return the all track number of the disc.)	"ATN:?"	DISC number : x TRACK number : yyy	"ATN:xyyy"

Status request		Status answer and feedback	
KIND OF DISC	"KOD:?"	NONE	"KOD:0"
		CDDA	"KOD:1"
		MP3	"KOD:6"
		UNDIFINE	"KOD:－"
		TOC READ	"KOD:Z" *Capital letter
RANDOM	"RDM:?"	OFF	"RDM:1"
		1 DISC RANDOM	"RDM:2"
		ALL DISC RANDOM	"RDM:4"
PROGRAM	"PRG:?"	ON	"PRG:1"
		OFF	"PRG:2"
RECALL	"RCL:?"	"RCL:?"	"RCL:xxyzzz" xx = Program number y=DISC NO, zzz=TRK No. If not programed xyz=0 If zzz = ALL, select all track. (When CC4001 displays "END", xx = "--" y = "-" zzz = "END")

4-1-3. Special Status request and Status answer list

Status request		Status answer and feedback
Auto status feedback	"AST:?"	see command list
Read Host I/F Software Version	"RSV:?"	"RSV:xx" (xx = '0'~'9', 'A'~'Z' or 'a'~'z') Set Default Value = 01

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4-1-4. Layer of the statuses

Status		Layer
POWER	"PWR:"	1
TRAY	"TRY:"	1
DISC NUMBER	"DSC:"	2
TIME MODE	"TMD:"	3
DIMMER	"DIM:"	3
REPEAT MODE	"REP:"	2
PLAY MODE	"PMD:"	1
AMS MODE	"AMS:"	1
RANDOM	"RDM"	2
RECALL	"RCL"	2
PROGRAM	"PRG:"	2
TRAY NUMBER	"TNO:"	1

Status		Layer
PLAY TIME	"TIM:"	4
TRACK NUMBER	"TRK:"	3
KIND OF DISC	"KOD:"	2
ALL TRACK NUMBER	"ATN:"	2

Status		Layer
Numeric Keys	"NUM:"	0 (write only)
TRACK SEARCH	"TRK:"	0 (write only)
GO/TO TRACK	"SRH:"	0 (write only)

Status		Layer
Auto status feedback	"AST:"	1
Read Host I/F Software version	"RSV:"	1

5.   Revision history

Rev.	Date	Owner	Change description
1.0	08/04/06	Marantz America, Inc.	Issued Revision1.0