TASCAM MX-8A

CONTROL I/O Terminals

RS-485 Protocol Specifications

Ver. 1.00

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TEAC Corporation

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1. Overview

Using the RS-485 connector built into the MX-8A, a remote controller or other external device can be used to control the MX-8A.

In this document, the MX-8A is the Master and the external device is the Slave.

2. Specifications

RS-485 connector

Electronic specifications

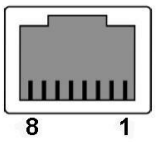
Standard used	EIA RS-485

Communication format

Circuit type	2-wire, Half-duplex
Synchronization method	Asynchronous (start-stop)
Connection type	1: N
Maximum number of connections	8 units (daisy-chained)
Baud rate	115200 bps
Data bits	8 bits
No parity bit	
Stop bits	1 bit
Cable	Category 5e or faster STP cable

Connector pin-out

Connector	RJ-45

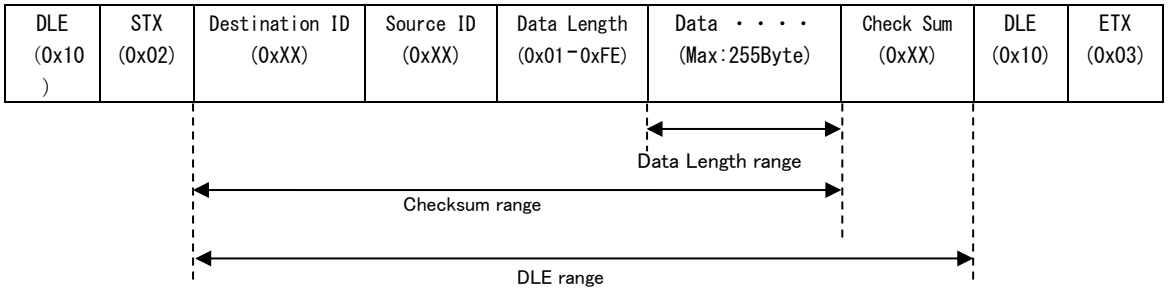


Pin No.	Signal name	Description
1	B	TD+
2	A	TD-
3	NC	Not connected
4	DC24V	DC24V
5	GND	Signal ground pin
6	NC	Not connected
7	NC	Not connected
8	GND	Signal ground pin

3. Communications frames

3.1 Communications frame details

Communications frames are as follows.
The range between DLE+STX and DLE+ETX is one frame.



Details about each field are as follows.

Item	Description
DLE	Data Link Escape(0x10)
STX	Start of Text(0x02)
Destination ID	ID of destination. Master: 0x00/Slave: 0x01-0xFE/Reserved: 0xFF
Source ID	ID of source. Master: 0x00/Slave: 0x01-0xFE/Reserved: 0xFF
Data Length	Byte length of data field (0x01 - 0xFE)
Data	Data. 255 byte maximum.
Check Sum	Checksum from Destination ID to Data. 1 byte.
DLE	Data Link Escape(0x10)
ETX	End of Text(0x03)

3.2 DLE range and DLE extension

The DLE range is from the Destination ID to the Checksum.
If DLE (0x10) occurs within this range, the frame is sent with DLE appended (0x10 0x10).
Example:
[Before] 0x10 0x02 0x01 0x00 0x01 **0x10** 0x12 0x10 0x03
[After] 0x10 0x02 0x01 0x00 0x01 **0x10** **0x10** 0x12 0x10 0x03

3.3 Checksum range

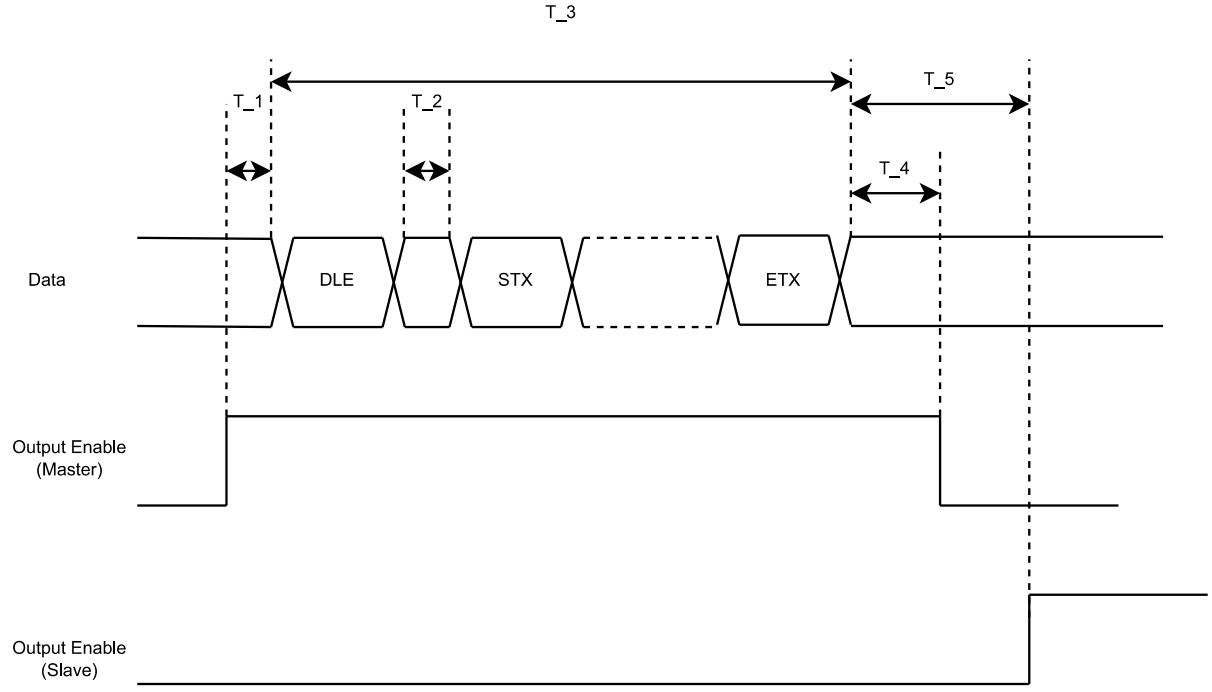
The Checksum range is from the Destination ID to the Data.
The Checksum calculation occurs before the DLE extension.
Example:
[Before] 0x10 0x02 0x01 0x00 0x01 0x10 **0x12** 0x10 0x03
[After] 0x10 0x02 0x01 0x00 0x01 0x10 0x10 **0x12** 0x10 0x03
*The Checksum is before the DLE extension

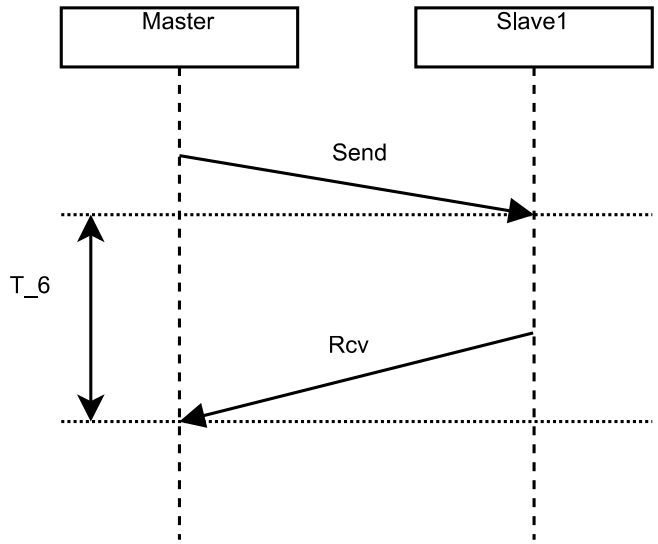
4. Various time restrictions

The various time restrictions are as follows.

Symbol	Name	MIN	MAX	Description
T_1	Output Enable retention time	-	-	Depends on driver used
T_2	Timeout between bytes	-	2msec	Timeout between bytes
T_3	Frame reception timeout	-	-	Depends on time between bytes and frame size
T_4	Time to switch between sending and receiving	-	3msec	Maximum Output Enable retention time after sending completes
T_5	Frame waiting time	4msec	-	Minimum time until sending next frame after sending completes
T_6	Response waiting time	-	20msec	Until reception completes

The timing chart is as follows.

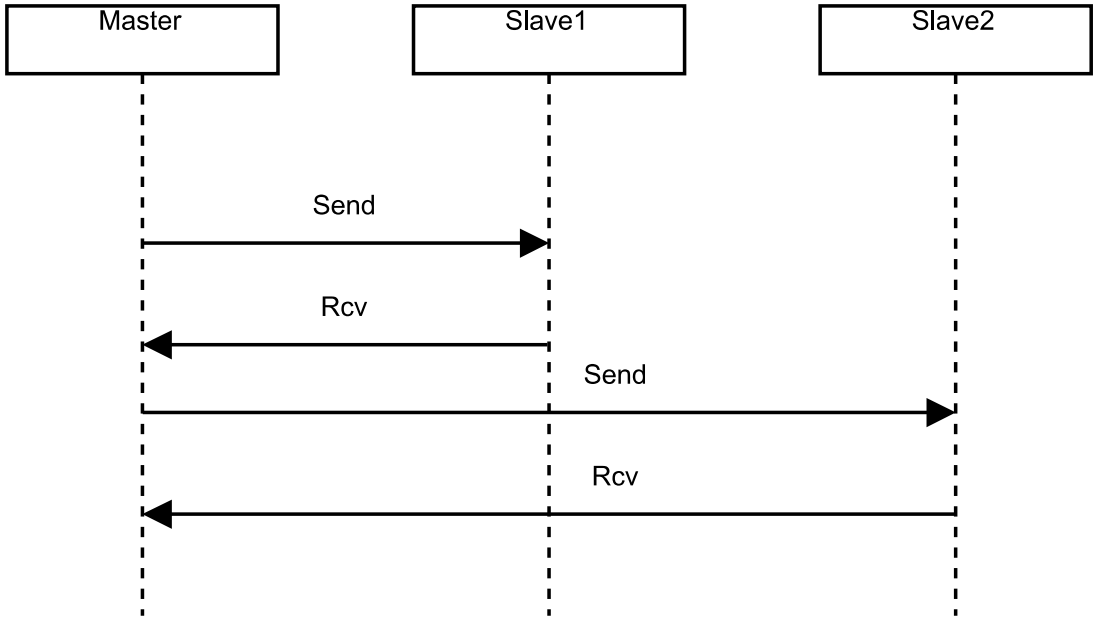



Master
Slave1
Send
T_6
Rcv

5. Communication sequence overview

The communication sequence is as follows.

A frame is sent from the Master to the Slave. Then, the Master receives a response from the Slave.



The following are examples of communications data.

● Master -> Slave

Example: Sending 4-byte data (0x01, 0x02, 0x03, 0x04) to the Slave (ID: 0x01)

DLE (0x10)	STX (0x02)	Dst ID (0x01)	Src ID (0x00)	Length (0x04)	Data[0] (0x01)	Data[1] (0x02)	Data[2] (0x03)	Data[3] (0x04)	Sum (0x0F)	DLE (0x10)	ETX (0x03)

(*)

● Slave -> Master

Example: Sending 1-byte data (0x01) to the Master (ID: 0x00)

DLE (0x10)	STX (0x02)	Dst ID (0x00)	Src ID (0x01)	Length (0x01)	Data[0] (0x01)	Sum (0x03)	DLE (0x10)	ETX (0x03)

(*)

(*) The actual Data [X] content changes according to the contents of “6. Message”, “7. Service ID” and “8. Data ID”.

6. Messages

The types of messages are as follows.

Item	Direction	Description
Request	Master -> Slave	Request message from the Master to the Slave
Positive response	Master -> Slave	Request OK message from the Slave to the Master
Negative response	Master -> Slave	Request NG message from the Slave to the Master

6.1 Request

Use to have the Master send a message to the Slave.
The structure of the message is as follows.

Service ID (0xXX)	Data parameter

- See “7. Service ID overview” for details about the Service ID (SID).
- The Data Parameter differs according to the SID.

6.2 Positive response

Use to have the Slave send a message to the Master when a Request has been received properly.
The structure of the message is as follows.

Service ID (0xXX)	Data Parameter

- See “7. Service ID overview” for details about the Service ID (SID).
- The Data Parameter differs according to the SID.

6.3 Negative response

Use to have the Slave send a message to the Master when a Request has not been received properly.
The structure of the message is as follows.

Negative response Service ID (0x7F)	Service ID (0xXX)	Response code

- For the Service ID (SID), set the service ID set from the Master.
- The Response Code list follows.

Response Code list

Value	Description
0x10	This can be used when implementation of a Negative Response Code as defined in this document cannot be fulfilled.
0x11	The requested SID is not supported.
0x12	The requested Sub-Function is not supported.
0x13	The request message length is abnormal.
0x31	The requested DID is not supported.

	The DID number requested at one time is too high.
0x72	Data writing failed.

7. Service ID(SID)

The types of Service IDs are as follows.

Item	Request SID	Response SID
Read data by ID	0x22	0x62
Write data by ID	0x2E	0x6E
Device reset	0x11	0x51
Device present	0x3E	0x7E
Negative response	–	0x7F

7.1 Read data by ID(RDBI)

By using RDBI services, the Master can retrieve data record values (DREC) that identify the Slave using Data IDs (DID).

・ See “8. Data ID (DID) overview” for details about DIDs.

RDBI Request message definition

・ RDBI Request messages can designate multiple 2-byte Data IDs (DID).

Data byte	Parameter name	Value	Mnemonic
#1	RDBI request SID	0x22	RDBI
#2 #3	Data ID []#1= [byte#1 (MSB) byte#2]	0x00 – 0xFF 0x00 – 0xFF	DID
:	:	:	:
#n-1 #n	Data ID []#m= [byte#1 (MSB) byte#2]	0x00 – 0xFF 0x00 – 0xFF	DID

RDBI Positive Response message definition

・ The format and definition of Data Records (DREC) in Response messages differ according to the DID.

・ See “8. Data ID (DID) overview” for details about Data Records (DREC).

Data byte	Parameter name	Value	Mnemonic
#1	RDBI positive response SID	0x62	RDBI
#2 #3	Data ID []#1= [byte#1 (MSB) byte#2]	0x00 – 0xFF 0x00 – 0xFF	DID
#4 :	Data record[] #1 = [data#1	0x00 – 0xFF :	DREC

#(k-1)+4	: data#k]	0x00 - 0xFF	
:	:	:	:
#n-(o-1)-2 #n-(o-1)-1	Data ID []#m= [byte#1 (MSB) byte#2]	0x00 - 0xFF 0x00 - 0xFF	DID
#n-(o-1) : #n	Data record[] #m = [data#1 : data#o]	0x00 - 0xFF : 0x00 - 0xFF	DREC

RDBI Request/Positive Response message examples

RDBI Request message example

Message direction		Master -> Slave	
Message type		Request	
Data byte	Parameter name	Value	Mnemonic
#1	RDBI response SID	0x22	RDBI
#2	DID #1 MSB	0x00	DID
#3	DID #1 LSB	0x01	DID

RDBI Positive Response message example

Message direction		Slave -> Master	
Message type		Response	
Data byte	Parameter name	Value	Mnemonic
#1	RDBI response SID	0x62	RDBI
#2	DID #1 MSB	0x00	DID
#3	DID #1 LSB	0x01	DID
#4	Data record #1	0xAA	DREC

7.2 Write data by ID (WDBI)

By using WDBI services, the Master can write data record values (DREC) that identify the Slave using Data IDs (DID).

・ See “8. Data ID (DID) overview” for details about DIDs.

WDBI Request message definition

Request messages include 2-byte Data IDs (DID) and Data Records (DREC).

・ The format and definition of Data Records (DREC) in Request messages differ according to the DID.

・ See “8. Data ID (DID) overview” for details about Data Records (DREC).

Data byte	Parameter name	Value	Mnemonic
#1	RDBI request SID	0x2E	WDBI
#2 #3	Data ID []#1= [byte#1 (MSB) byte#2]	0x00 - 0xFF 0x00 - 0xFF	DID
#4 : #k+3	Data record[] #1 = [data#1 : data#k]	0x00 - 0xFF : 0x00 - 0xFF	DREC

WDBI Positive Response message definition

For the DID, set the DID set with the Request message.

Data byte	Parameter name	Value	Mnemonic
#1	WDBI response SID	0x6E	WDBI
#2 #3	Data ID []#1= [byte#1 (MSB) byte#2]	0x00 - 0xFF 0x00 - 0xFF	DID

WDBI Request/Positive Response message examples

WDBI Request message example

Message direction		Master->Slave	
Message type		Request	
Data byte	Parameter name	Value	Mnemonic
#1	WDBI request SID	0x2E	WDBI
#2	DID #1 MSB	0x00	DID
#3	DID #1 LSB	0x01	DID
#4	Data record #1	0x55	DREC

WDBI Positive Response message example

Message direction:		Slave -> Master	
Message type:		Response	
Data byte	Parameter name	Value	Mnemonic
#1	WDBI response SID	0x6E	WDBI
#2	DID #1 MSB	0x00	DID
#3	DID #1 LSB	0x01	DID

7.3 Device reset (DR)

By using the DR service, the Master can request resetting of the Slave.
Hardware reset and software reset types can be designated.

DR Request message definition

Set the reset type in the Sub-Function.

Data byte	Parameter name	Value	Mnemonic
#1	DR request SID	0x11	DR
#2	Sub-function (Reset type) = 0x01 : Hardware reset 0x03 : Software reset		RT

DR Positive Response message definition

Data byte	Parameter name	Value	Mnemonic
#1	WDBI response SID	0x51	DRPR
#2	Reset type		RT

DR Request/Positive Response message examples

DR Request message example

Message direction		Master -> Slave	
Message type		Request	
Data byte	Parameter name	Value	Mnemonic
#1	DR response SID	0x11	DR
#2	Reset type	0x01	RT

DR Positive Response message example

Message direction		Slave -> Master	
Message type		Response	
Data byte	Parameter name	Value	Mnemonic
#1	DR response SID	0x51	DR
#2	Reset type	0x01	RT

7.4 Device present(DP)

By using the DP service, the Master can confirm whether the Slave is connected.

DP Request message definition

Set 0x00 (fixed) in #2 (Sub-Function).

Data byte	Parameter name	Value	Mnemonic
#1	DR request SID	0x3E	DP
#2	Sub-function (Zero sub function)	0x00	ZSUBF

DP Positive Response message definition

Set 0x00 (fixed) in #2 (Sub-Function).

Data byte	Parameter name	Value	Mnemonic
#1	DR response SID	0x7E	DP
#2	Sub-function (Zero sub function)	0x00	ZSUBF

DP Request/Positive Response message examples

DP Request message example

Message direction		Master -> Slave	
Message type		Request	
Data byte	Parameter name	Value	Mnemonic
#1	DP request SID	0x3E	DP
#2	Sub-function (Zero sub function)	0x00	ZSUBF

DP Positive Response message example

Message direction		Slave -> Master	
Message type		Response	
Data byte	Parameter name	Value	Mnemonic
#1	DP response SID	0x7E	DP
#2	Sub-function (Zero sub function)	0x00	ZSUBF

8. Data ID (DID)

The Data ID list is as follows.

Data ID item	Value	RDBI	WDBI
Type	0x0001	☑	☐
Version	0x0010	☑	☐
Model name	0x0011	☑	☐
Source select	0x0101	☑	☐
Volume	0x0102	☑	☐
Mute	0x0103	☑	☐
Device init	0x0201	☐	☑
Source assign	0x0202	☐	☑
Update value	0x0203	☐	☑

・ Data record values set with the WDBI service differ according to the settings of the main unit. For details, see the TASCAM MX CONNECT operation manual (CONTROLLER screen).

・ Set whether the data record value set with the WDBI service is used or not and how it is used appropriately on the Slave.

8.1 Type (0x0001)

Use to have the Master query the Slave about the device type.

・ Set Master to return 0x00 (fixed).

Byte	Description
#1	Device type (0x00: fixed)

8.2 Version (0x0010)

Use to have the Master query the Slave about the device version.

・ Data length is fixed to 4 bytes.

Byte	Description
#1 - #4	Device version (4-byte fixed) Example when the device version is 1.00 -> [0x00][0x01][0x00][0x00]

8.3 Model name (0x0011)

Use to have the Master query the Slave about the device model name.

・ Set to 8-byte-fixed data length and ASCII code.

Byte	Description
#1 - #8	Device model name (8-byte fixed, ASCII code) Example when the model name is RC-W100 -> "RC-W100 "

8.4 Source Select (0x0101)

Use to have the Master query the Slave about the currently selected input source number.

The input source will change for the Master according to the received input source number.

・ When no input source is selected, set to 0x00.

Byte	Description
#1	The currently selected input source number: 0x01 - 0xFF (no input source selected: 0x00)

8.5 Volume (0x0102)

Use to have the Master query the Slave about the current Volume value.
The Master changes the MIX master channel fader level according to the Volume value received.
・ See “10.1 Volume value table” for the dB values of Volume values (0 - 100).

Byte	Description
#1	Current Volume value: 0 - 100 (0x00 - 0x64)

8.6 Mute (0x0103)

Use to have the Master query the Slave about the current mute setting (ON/OFF).
The Master changes the MIX master channel mute setting according to the mute setting received.

Byte	Description
#1	Current mute setting: OFF (0x00)/ON (0x01)

8.7 Device init (0x0201)

Use to write the MODE, maximum number of assignable sources, enabling/disabling of Volume changes, enabling/disabling of the mute setting and the LCD backlight off timer value from the Master to the Slave.

Byte	Description
#1	Current MODE setting: MODE1 (0x01)/MODE2 (0x02)
#2	Maximum number of assignable sources: 0 (0x00)/1 - 255 (0x01 - 0xFF) ・ If there are no assignable sources set this to 0x00. Use when you do not want to change the source on the Slave.
#3	Volume change enabled/disabled setting: enabled (0x01)/disabled (0x00) ・ Set to disabled (0x00) when you do not want to change the Volume on the Slave.
#4	Mute setting enabled/disabled setting: enabled (0x01)/disabled (0x00) ・ Set to disabled (0x00) when you do not want to change the mute ON/OFF setting on the Slave.
#5 - #6	LCD backlight off timer: #5 [minutes] (0-255)/#6 [seconds] (0-59) If the Slave is not operated for the set time, the LCD backlight will turn off. ・ Set to 0 minutes, 0 seconds: always on

・ For details of each setting, see the TASCAM MX CONNECT operation manual (CONTROLLER screen).

8.8 Source Assign (0x0202)

Use to write the source name shown on the Slave from the Master.

Byte	Description
#1	Set source number: 1 - 255 (0x01 - 0xFF)
#2	Set source number of bytes: 1 - 253 (0x01 - 0xFD)
#3	Set source name character string

・ The Master uses UTF-8 for the source name. Set the Master Input name so that it can be handled by the Slave to show it, for example, on the Slave.

8.9 Update Value (0x0203)

Use to write the currently selected source number, the current Volume value and the current mute setting from the Master to the Slave.

Byte	Description
#1	Currently selected input source number: 0 (0x00)/1 - 255 (0x01 - 0xFF) ・ Set to 0x00 when the selected source is muted by external control, for example.
#2	Current MIX Master channel Volume value: 0 - 100 (0x00 - 0x64) ・ See “10.1 Volume value table” for the dB values of Volume values.
#3	Current MIX Master channel mute setting: OFF (0x00)/ON (0x01)

9. Sequence

9.1 Sequence overview

The Master and Slave establish connection through the following steps.
In addition, requests sent from the Master to the Slave are also shown.

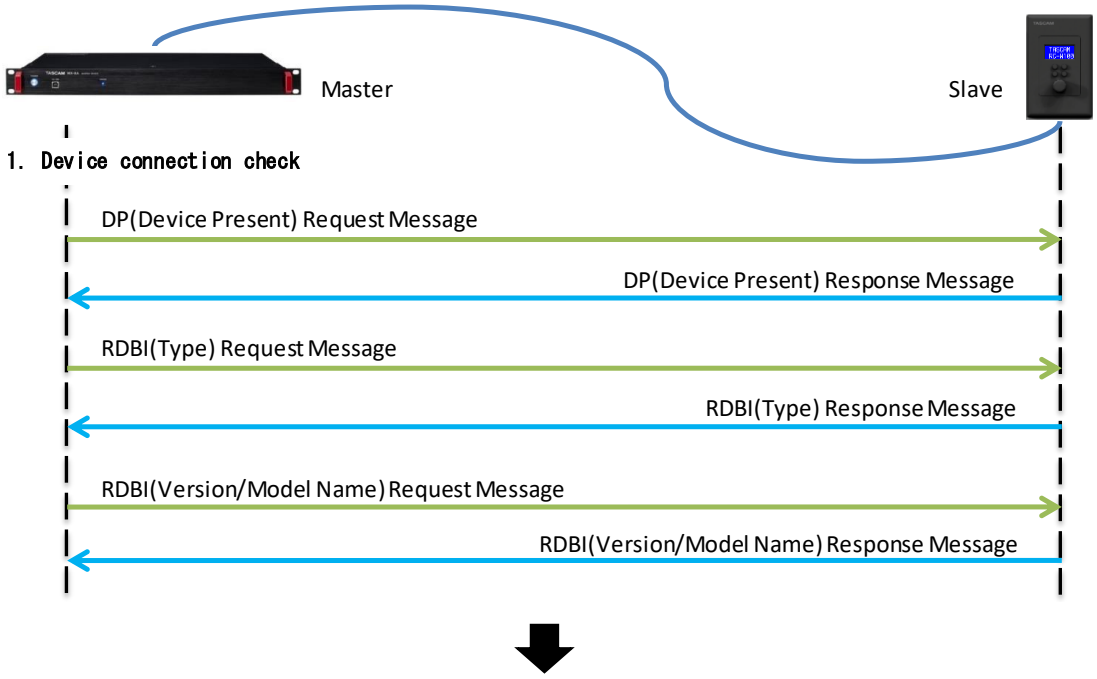
1. Device connection check
   1-1. Device Present message (Request SID: 0x3E)
   1-2. Read Data By ID message (Request SID: 0x22)/Type (Data ID: 0x0001)
   1-3. Read Data By ID message (Request SID: 0x22)/Version (Data ID: 0x0010)
   /Model name (0x0011)

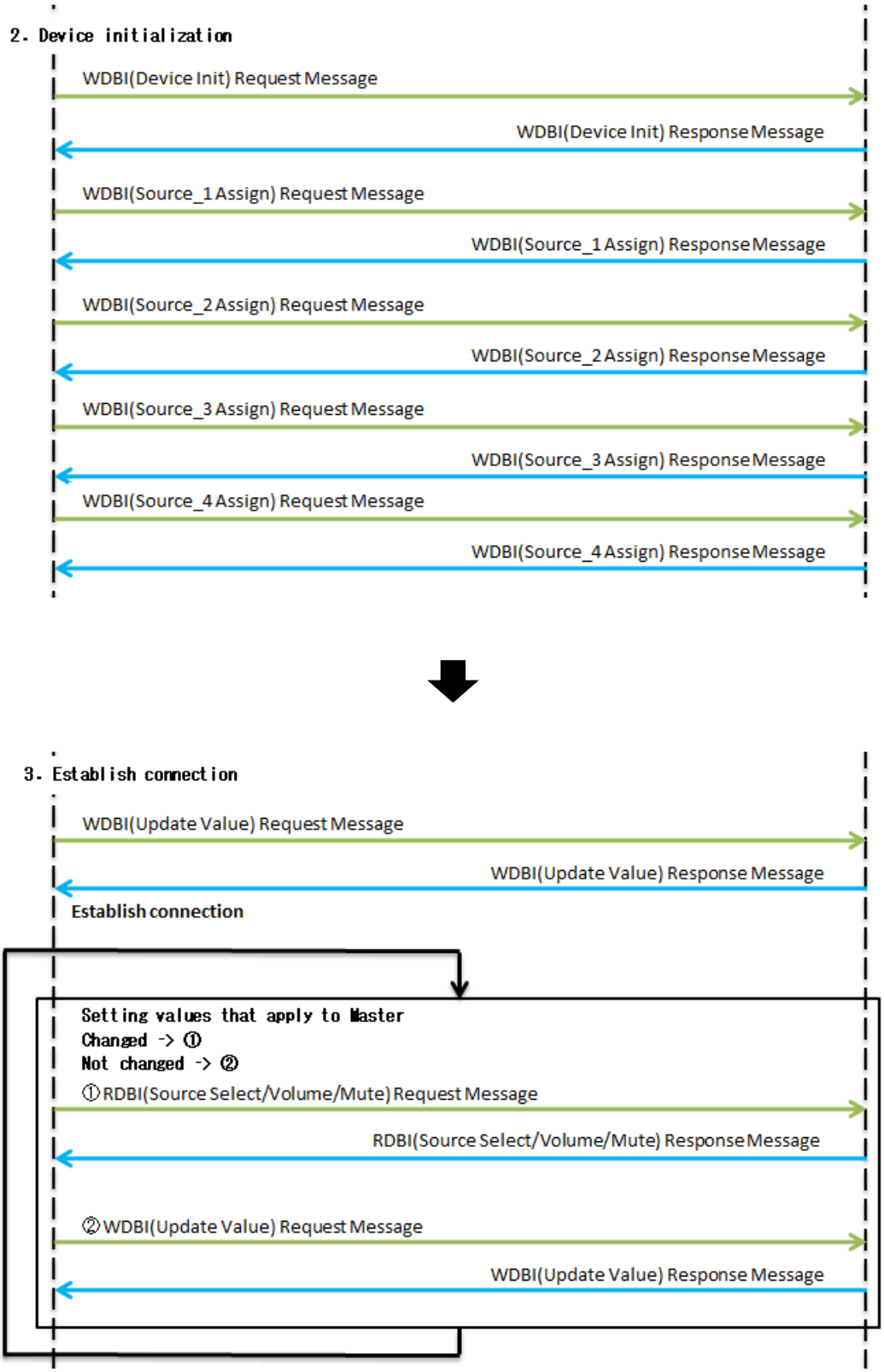
2. Device initialization
   2-1. Write Data By ID message (Request SID: 2E)/Device Init (Data ID: 0x0201)
   2-2. Write Data By ID message (Request SID: 2E)/Source Assign (Data ID: 0x0202)
   - This requests only the number of assignable sources.

3. Establish connection
   3-1. Write Data By ID message (Request SID: 2E)/Update Value (Data ID: 0x0203)
   - After device initialization completes, send this request to notify the Slave about the Master setting values.
   - When a response to this request is properly received from the Slave, connection is established.
   3-2. Read Data By ID message (Request SID: 0x22)/Source Select (Data ID: 0x0101)
   /Volume (Data ID: 0x0102)
   /Mute (Data ID: 0x0103)
   - If setting values that apply to the Master do not change, send this message periodically to the Slave.
   - If setting values that apply to the Master have changed, send “3-1. Update Value” to the Slave.

9.2 Sequence examples

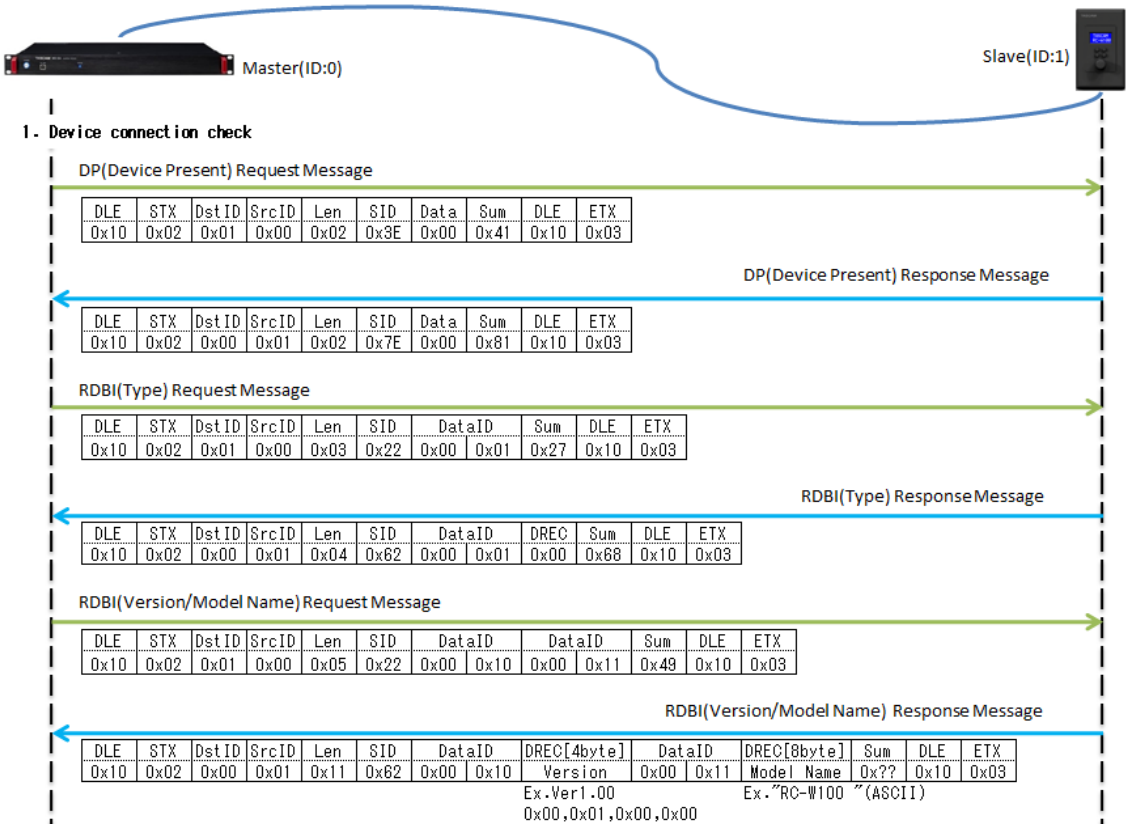
Basic sequence examples are shown below.
Slave: 1 unit with 4 assignable sources




2. Device initialization
WDBI(Device Init) Request Message
WDBI(Device Init) Response Message
WDBI(Source_1 Assign) Request Message
WDBI(Source_1 Assign) Response Message
WDBI(Source_2 Assign) Request Message
WDBI(Source_2 Assign) Response Message
WDBI(Source_3 Assign) Request Message
WDBI(Source_3 Assign) Response Message
WDBI(Source_4 Assign) Request Message
WDBI(Source_4 Assign) Response Message
3. Establish connection
WDBI(Update Value) Request Message
WDBI(Update Value) Response Message
Establish connection
Setting values that apply to Master
Changed -> ①
Not changed -> ②
①RDBI(Source Select/Volume/Mute) Request Message
RDBI(Source Select/Volume/Mute) Response Message
②WDBI(Update Value) Request Message
WDBI(Update Value) Response Message

9.3 Detailed message contents

The following is an example of detailed message contents while establishing connection.
Slave: 1 unit with 4 assignable sources named Input1, Input2, Input3, and Input4



2. Device

2. Device initialization

WDBI(Device Init) Request Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Data	Data	Data	Data	Data	Data	Sum	DLE	ETX
0x10	0x02	0x01	0x00	0x09	0x2E	0x02	0x01	0x01	0x04	0x01	0x01	0x00	0x00	0x42	0x10	0x03
						Device Init		Mode	Maximum number of assignable sources	Enable / disable volume change	Enable / Disable Mute Button	LCD off timer(Minutes)	LCD off timer(Seconds)			

WDBI(Device Init) Response Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Sum	DLE	ETX
0x10	0x02	0x01	0x00	0x03	0x6E	0x02	0x01	0x75	0x10	0x03

WDBI(Source_1 Assign) Request Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Data	Data	Data#3 - #10								Sum	DLE	ETX
0x10	0x02	0x01	0x00	0x0D	0x2E	0x02	0x02	0x01	0x08	0x49	0x6E	0x70	0x75	0x74	0x31	0x20	0x20	0xCA	0x10	0x03
						Source Assign		Source number to set	String length of source name to be set(bytes)	"I"	"n"	"p"	"u"	"t"	"1"	"␣"	"␣"			

WDBI(Source_1 Assign) Response Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Sum	DLE	ETX
0x10	0x02	0x00	0x01	0x03	0x6E	0x02	0x02	0x76	0x10	0x03

WDBI(Source_2 Assign) Request Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Data	Data	Data#3 - #10								Sum	DLE	ETX
0x10	0x02	0x01	0x00	0x0D	0x2E	0x02	0x02	0x02	0x08	0x49	0x6E	0x70	0x75	0x74	0x32	0x20	0x20	0xCB	0x10	0x03
										"I"	"n"	"p"	"u"	"t"	"2"	"␣"	"␣"			

WDBI(Source_2 Assign) Response Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Sum	DLE	ETX
0x10	0x02	0x00	0x01	0x03	0x6E	0x02	0x02	0x76	0x10	0x03

WDBI(Source_3 Assign) Request Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Data	Data	Data#3 - #10								Sum	DLE	ETX
0x10	0x02	0x01	0x00	0x0D	0x2E	0x02	0x02	0x03	0x08	0x49	0x6E	0x70	0x75	0x74	0x33	0x20	0x20	0xCC	0x10	0x03
										"I"	"n"	"p"	"u"	"t"	"3"	"␣"	"␣"			

WDBI(Source_3 Assign) Response Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Sum	DLE	ETX
0x10	0x02	0x00	0x01	0x03	0x6E	0x02	0x02	0x76	0x10	0x03

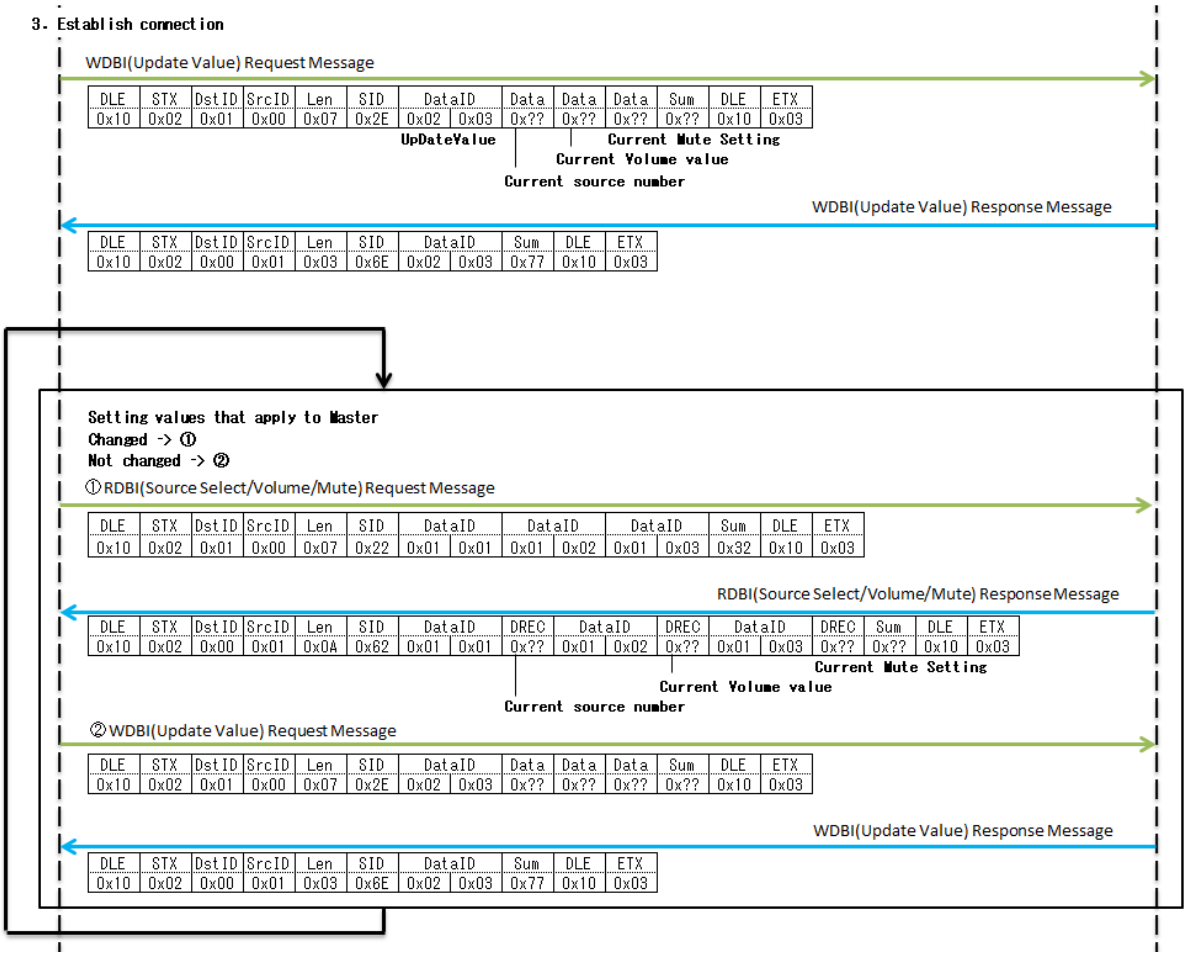
WDBI(Source_4 Assign) Request Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Data	Data	Data#3 - #10								Sum	DLE	ETX
0x10	0x02	0x01	0x00	0x0D	0x2E	0x02	0x02	0x04	0x08	0x49	0x6E	0x70	0x75	0x74	0x34	0x20	0x20	0xCD	0x10	0x03
										"I"	"n"	"p"	"u"	"t"	"4"	"␣"	"␣"			

WDBI(Source_4 Assign) Response Message

DLE	STX	DstID	SrcID	Len	SID	DataID		Sum	DLE	ETX
0x10	0x02	0x00	0x01	0x03	0x6E	0x02	0x02	0x76	0x10	0x03

3. Establishing connection begins


3. Establish connection
WDBI(Update Value) Request Message
DLE STX DstID SrcID Len SID DataID Data Data Data Sum DLE ETX
0x10 0x02 0x01 0x00 0x07 0x2E 0x02 0x03 0x?? 0x?? 0x?? 0x?? 0x10 0x03
UpDateValue
Current Mute Setting
Current Volume value
Current source number
WDBI(Update Value) Response Message
DLE STX DstID SrcID Len SID DataID Sum DLE ETX
0x10 0x02 0x00 0x01 0x03 0x6E 0x02 0x03 0x77 0x10 0x03
Setting values that apply to Master
Changed -> ①
Not changed -> ②
①RDBI(Source Select/Volume/Mute) Request Message
DLE STX DstID SrcID Len SID DataID DataID DataID Sum DLE ETX
0x10 0x02 0x01 0x00 0x07 0x22 0x01 0x01 0x01 0x02 0x01 0x03 0x32 0x10 0x03
RDBI(Source Select/Volume/Mute) Response Message
DLE STX DstID SrcID Len SID DataID DREC DataID DREC DataID DREC Sum DLE ETX
0x10 0x02 0x00 0x01 0x0A 0x62 0x01 0x01 0x?? 0x01 0x02 0x?? 0x01 0x03 0x?? 0x?? 0x10 0x03
Current Mute Setting
Current Volume value
Current source number
②WDBI(Update Value) Request Message
DLE STX DstID SrcID Len SID DataID Data Data Data Sum DLE ETX
0x10 0x02 0x01 0x00 0x07 0x2E 0x02 0x03 0x?? 0x?? 0x?? 0x?? 0x10 0x03
WDBI(Update Value) Response Message
DLE STX DstID SrcID Len SID DataID Sum DLE ETX
0x10 0x02 0x00 0x01 0x03 0x6E 0x02 0x03 0x77 0x10 0x03

10. Appendix

10.1 Volume value table

Volume value	dB value	Volume value	dB value	Volume value	dB value	Volume value	dB value
100	+10.0dB	74	-1.9dB	48	-13.2dB	22	-33.3dB
99	+9.4dB	73	-2.3dB	47	-13.9dB	21	-34.1dB
98	+8.9dB	72	-2.6dB	46	-14.7dB	20	-34.9dB
97	+8.4dB	71	-2.9dB	45	-15.4dB	19	-35.7dB
96	+7.8dB	70	-3.2dB	44	-16.1dB	18	-36.5dB
95	+7.3dB	69	-3.5dB	43	-16.8dB	17	-37.2dB
94	+6.8dB	68	-3.8dB	42	-17.5dB	16	-38.0dB
93	+6.3dB	67	-4.2dB	41	-18.3dB	15	-38.8dB
92	+5.7dB	66	-4.5dB	40	-19.0dB	14	-39.6dB
91	+5.2dB	65	-4.8dB	39	-19.7dB	13	-40.7dB
90	+4.7dB	64	-5.1dB	38	-20.5dB	12	-42.4dB
89	+4.2dB	63	-5.6dB	37	-21.3dB	11	-44.1dB
88	+3.8dB	62	-6.0dB	36	-22.1dB	10	-45.8dB
87	+3.3dB	61	-6.4dB	35	-22.9dB	9	-47.5dB
86	+2.8dB	60	-6.8dB	34	-23.7dB	8	-49.2dB
85	+2.3dB	59	-7.3dB	33	-24.5dB	7	-50.9dB
84	+1.9dB	58	-7.7dB	32	-25.3dB	6	-52.6dB
83	+1.4dB	57	-8.1dB	31	-26.1dB	5	-54.4dB
82	+0.9dB	56	-8.5dB	30	-27.0dB	4	-56.1dB
81	+0.4dB	55	-8.9dB	29	-27.8dB	3	-57.8dB
80	0.0dB	54	-9.4dB	28	-28.6dB	2	-59.5dB
79	-0.4dB	53	-9.8dB	27	-29.4dB	1	-81.5dB
78	-0.7dB	52	-10.3dB	26	-30.2dB	0	-inf.
77	-1.0dB	51	-11.1dB	25	-31.0dB		
76	-1.3dB	50	-11.8dB	24	-31.8dB		
75	-1.6dB	49	-12.5dB	23	-32.5dB		

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