AM-CF1

External Control Protocol - TCP/IP

Ver.1.0.10 2019/11/6

■ Overview

The protocols disclosed in this document are prepared to control AM-CF1 via third-party controllers or via a computer based terminal application and obtain device information for further integrations.

It is required to log in by password authentication for starting controls and log out when finishing controls.

- **Log-in**
- **Log-out**

The following settings can be controlled.

- Speaker output gain
- Mute mode
- Recalling memory presets
- Standby mode
- Bluetooth mode
- Microphone beam steering
- Status notification
- Microphone beam steering status notification

The following commands can also be used to get the AM-CF1 setting values.

- Status request
  - ✧ Gain value
  - ✧ Mute mode
  - ✧ Preset number
  - ✧ Standby mode
  - ✧ Bluetooth mode
  - ✧ Microphone beam steering setting
  - ✧ Microphone beam steering position
- Status information
  - ✧ Microphone beam steering position information （Real-time status of AM-CF1）

■ Introduction

The external control port of AM-CF1 needs to be set before connecting to the unit by using this protocol.

・Target port

TCP port number: Set the port number according to the remote controller to be connected.

Default value: 3000

■ TCP/IP Communication Specification

#	Item	Contents （implementation rules）
1	Communication path	One pathway
2	Message length	Variable length max. 1024 bytes
3	Message code type	Binary
4	Confirmation of delivery	If a handshake is performed at the application layer and there is no response from the AM-CF1 for 1 sec, it is preferable to design the communication timeout
5	Retransmission control	None
6	Priority control	None

- Define AM-CF1 as the TCP server.
- TCP port is always connected （keeps alive）.
- To maintain the connection, AM-CF1 performs the following operations.
  - Send some data at least once in 10 seconds. If there is a status to be sent as data, the content is transmitted otherwise just send 0xFF by 1 byte.
  - If nothing is received from the remote controller for one minute, the TCP/IP connection shall be automatically terminated.

■ Command Configuration

- Command | Data length（N） | Data 1 | Data 2 | ・・・・ | Data N
- Commands are 80H to FFH, data length is 00H to 7F, and data is 00H to FFH
- Data length （N） is included information representing the data length following the data
- When a data which is longer than the data length is received, the subsequent data is discarded.
- If a data is shorter than the data length and the next command is received, the previous command is discarded.
- When a TCP/IP communication is disconnected, it enables reconnection.

■ Control Commands and Setting Value

● Log-in

Control commands are accepted only when the log-in information matches the password authentication information in the web browser. If they do not match, AM-CF1 returns a login NACK response as a command （except log-in and log-out） to the controller. If the communication with the controller is disconnected, the system will be logged out and the controller needs to log in again.
Once the AM-CF1 receives this command, it responds the password authentication result.

Command：80H, 20H, <User Name>, <Password>

<User Name>

Specifies 16-byte ASCII codes

If the value is less than 16 bytes, the missing value is filled with the NULL character （0x00）.

<Password>

Specifies 16-byte ASCII codes

If the value is less than 16 bytes, the missing value is filled with the NULL character （0x00）.

（e.g.） If User Name is admin and Password is admin （=default setting）

80H, 20H, 61H, 64H, 6DH, 69H, 6EH, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 61H, 64H, 6DH, 69H, 6EH, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H, 00H

AM-CF1 Response：The response is generated according to the password authentication result.

ACK response when matched： 80H, 01H, 01H

NACK response when not matched：80H, 01H, 00H

● Log-out

Turn the unit from login status to log-out status
Once the AM-CF1 receives this command, it turns the unit into log-out status and responds the operation result.

Command：81H, 00H

AM-CF1 Response：81H, 00H

- **Speaker output gain setting （absolute position）**

Set the gain level of the speaker output by absolute position.

Please refer to the “Gain Table” chart to check the absolute positions corresponding to gain values （dB）.

Once the AM-CF1 receives this command, it changes the gain level and responds the changed final value.

Command：91H, 03H, <Channel Attribute>, <Channel Number>, <Position>

<Channel Attribute>

01H: Speaker Out channel（fixed value）

<Channel Number>

00H: Channel Attribute（fixed value） * Channel Attribute 00H updates web gain settings

<Position>

00H to 3FH （-∞ to 0dB, Please refer to “Gain Table” chart）

（e.g.） Set the speaker output gain of the unit to 0dB

91H, 03H, 01H, 00H, 3DH

AM-CF1 Response：91H, 03H, <Channel Attribute>, <Channel Number>, <Position>

- **Speaker output gain setting （step）**

Set the gain level of the speaker output by position steps.

The gain position can be step up or down from the current position.

Each step changes one position.

Once the AM-CF1 received this command, it changes the gain position and responds the changed position value.

Command：91H, 03H, <Channel Attribute>, <Channel Number>, <Step>

<Channel Attribute>

01H: Speaker Out channel（fixed value）

<Channel Number>

00H: Channel Attribute（fixed value） * Channel Attribute 00H updates web gain settings

<Step>

UP: 41H to 5FH（1 step up to 31 step up,（e.g.） 1step up = 41H）

Down: 61H to 7FH（1 step down to 31 step down,（e.g.） 1step down = 61H）

*The minimum value （position） for step down shall be 01H.

（e.g.） Increase the speaker output gain level by 3 steps

91H, 03H, 00H, 00H, 43H

AM-CF1 Response：91H, 03H, <Channel Attribute>, <Channel Number>, <Position>

<Position>

00H to 3FH （-∞ to 0dB, Please refer to “Gain Table” chart）

- **Mute mode setting**

Set the mute mode of the audio input and output channels.

Once the AM-CF1 receives this command, it changes the mute mode and responds the changed final value.

Command：98H, 03H, <Channel Attribute>, <Channel Number>, <ON/OFF>

<Channel Attribute>

00H: Mic In channel

01H: Speaker Out channel

<Channel Number>

00H: Channel Attribute（fixed value）

<ON/OFF>

00H: Mute mode OFF （unmuted）

01H: Mute mode ON （muted）

（e.g.） Set the microphone mute mode of the unit to ON

98H, 03H, 00H, 00H, 01H

AM-CF1 Response：98H, 03H, <Channel Attribute>, <Channel Number>, <ON/OFF>

- **Recalling memory presets**

Recall a pre-stored memory preset.

Once the AM-CF1 receives this command, it recalls a pre-stored memory preset and responds the changed preset number.

Command：F1H, 02H, 00H, <Preset Number>

<Preset Number>

00H to 01H: Preset Number 1 to 2

（e.g.） Recall preset 1

F1H, 02H, 00H, 00H

*Since recalling memory preset requires a certain processing time, it is necessary to adjust the response wait time.

AM-CF1 Response：F1H, 02H, 00H, <Preset Number>

- **Standby mode setting**

  Set the standby mode of the unit.

  Once the AM-CF1 receives this command, it changes the unit standby mode and responds the changed mode status.

  Command：F3H, 02H, 00H, <Standby mode>

  <Standby mode>

  00H: Standby mode OFF

  01H: Standby mode ON

  （e.g.） Turn the unit into standby mode

  F3H, 02H, 00H, 01H

  AM-CF1 Response：F3H, 02H, 00H, <Standby mode>

- **Bluetooth mode setting**

Set the Bluetooth mode of the unit.

When the unit is set as ON mode, it starts Bluetooth pairing registration and becomes discoverable.

When the unit is set as OFF mode, it disconnects Bluetooth connection or cancels Bluetooth pairing registration.

Once the AM-CF1 receives this command, it changes the unit Bluetooth mode and responds the changed mode status.

Command：F5H, 02H, 00H, <ON/OFF>

<ON/OFF >

00H:OFF（Disconnect Bluetooth connection or cancel Bluetooth pairing registration）

01H:ON（Start Bluetooth pairing registration）

（e.g.）Start Bluetooth pairing registration.

F5H, 02H, 00H, 01H

AM-CF1 Response：F5H, 02H, 00H, <Bluetooth Mode>

<Bluetooth Mode>

00H: OFF

01H: In pairing registration

02H: In connection

Bluetooth Mode （Bluetooth Indicator）	Bluetooth mode setting	
	ON	OFF
OFF （OFF）	Start Bluetooth pairing registration. （Flashing blue）	No action （OFF）
In pairing registration （Flashing blue）	Continue Bluetooth pairing registration. （Flashing blue）	Cancel Bluetooth pairing registration. （OFF）
In connection （Blue）	Maintain Bluetooth connection. （Blue）	Disconnect Bluetooth connection. （OFF）

- **Microphone beam steering setting**

Set the microphone beam steering setting parameters. When the unit is set as Manual mode, the direction of the sound source is specified by Direction and the distance of the sound source is specified by Distance.

Command：A0H, 05H, <Auto/Manual>,<Direction>,<Distance>,<inch/cm>

<Auto/Manual>

00H: Auto

01H: Manual

<Direction>

Signed 1-byte integer

For Manual: -90 to 90 [deg]

For Auto: 0

<Distance>

An unsigned two-byte integer expressed in big-endian decimal places.

For Manual:

<inch/cm> For inch: 0 to 2400 [inch per 10]（0.0 to 240.0 [inch]）

<inch/cm> For cm: 0 to 6000 [cm per 10]（0.0 to 600.0 [cm]）

For Auto: 0

<inch/cm>

Only Manual is used.

00H: inch

01H: cm

（e.g.）Set Auto

A0H, 05H, 00H, 00H, 00H, 00H, 00H

（e.g.） In the Manual mode, set the Direction at -90, the Distance at 240.0, and the unit of length as inch.

A0H, 05H, 01H, A6H, 09H, 60H, 00H

AM-CF1 Response：A0H, 05H, <Auto/Manual>,<Direction>,<Distance>,<inch/cm>

- **Status notification setting**

Turn on or off the status notification function of the AM-CF1. The status notification is not performed when it is being logged out.

*The default value is OFF.

Command：F2H, 02H, 00H, <ON/OFF>

<ON/OFF>

00H: OFF（Status notification is disabled）

01H: ON（Status notification is enabled）

AM-CF1 Response：F2H, 02H, 00H, <ON/OFF>

- **Microphone beam steering status notification setting**

Turn on or off the microphone beam steering status notification function of the AM-CF1. The status notification is not performed when it is being logged out. Once the setting is ON, the microphone's beam steering position is notified by X and Y coordinate values with the specified unit of length at the set interval. Unlike status notification setting, notification is made at specified intervals regardless of the change in value.

*The default value is OFF.

Command：F2H, 04H, 01H, <Interval>, <inch/cm>, <ON/OFF>

<Interval>（0, 1 to 10[100msec units]）

00H: Immediate response

01H: 100msec

to

0AH: 1000msec（1sec）

<inch/cm>

00H: inch

01H: cm

<ON/OFF>

00H: OFF（Microphone beam steering status notification is disabled）

01H: ON（Microphone beam steering status notification is enabled）

AM-CF1 Response：F2H, 04H, 01H, <Interval>, <inch/cm>, <ON/OFF>

■ Status request command

● Status request（speaker output gain position）

This command requests the current gain position of the speaker output.

Once the AM-CF1 receives this command, it responds the current gain position value.

Command：F0H, 03H, 11H, <Channel Attribute>, <Channel Number>

<Channel Attribute>

01H: Speaker Out channel（fixed value）

<Channel Number>

00H: Channel Attribute（fixed value）

（e.g.）Request the speaker output gain position of the unit

F0H, 03H, 11H, 01H, 00H

AM-CF1 Response：91H, 03H, <Channel Attribute>, <Channel Number>, <Position>

● Status request（mute mode）

This command requests the current mute mode of the unit.

Once the AM-CF1 receives this command, it responds the current mute mode.

Command：F0H, 03H, 18H, <Channel Attribute>, <Channel Number>

<Channel Attribute>

00H: Mic In channel

01H: Speaker Out channel

<Channel Number>

00H: Channel Attribute（fixed value）

（e.g.）Request the microphone mute mode of the unit

F0H, 03H, 18H, 00H, 00H

AM-CF1 Response：98H, 03H, <Channel Attribute>, <Channel Number>, <ON/OFF>

- **Status request（memory preset number）**

  This command requests the current memory preset number of the unit.

  Once the AM-CF1 receives this command, it responds the current memory preset number.

  Command：F0H, 02H, 71H, 00H

（e.g.）Request preset number

F0H, 02H, 71H, 00H

AM-CF1 Response：F1H, 02H, 00H, <Preset Number>

- **Status request（standby mode）**

This command requests the current standby mode of the unit.

Once the AM-CF1 receives this command, it responds the current standby mode.

Command：F0H, 02H, 72H, 00H

（e.g.）Request standby mode

F0H, 02H, 72H, 00H

AM-CF1 Response：F3H, 02H, 00H, <Standby mode>

- **Status request（Bluetooth mode）**

This command requests the current Bluetooth mode of the unit.

Once the AM-CF1 receives this command, it responds the current Bluetooth mode.

Command：F0H, 02H, 74H, 00H

（e.g.） Request Bluetooth mode

F0H, 02H, 74H, 00H

AM-CF1 Response：F5H, 02H, 00H, <Bluetooth Mode>

- **Status request（microphone beam steering setting）**

  This command requests the current microphone beam steering setting of the unit.

  Once the AM-CF1 receives this command, it responds the current microphone beam steering setting.

  Command：F0H, 05H, 20H, 00H, 00H, 00H, 00H

  （e.g.）Request the microphone beam steering setting

  F0H, 05H, 20H, 00H, 00H, 00H, 00H

  AM-CF1 Response：A0H, 05H, <Auto/Manual>,<Direction>,<Distance>,<inch/cm>

- **Status request（microphone beam steering position）**

  This command requests the current microphone beam steering position of AM-CF1.

  Once the AM-CF1 receives this command, it responds the current microphone beam steering position.

  Command：F0H, 06H, 50H, 00H, 00H, 00H, 00H, <inch/cm>

  <inch/cm>

  00H: inch

  01H: cm

  （e.g.）Require the current microphone beam steering position

  F0H, 06H, 50H, 00H, 00H, 00H, 00H, 00H

  AM-CF1 Response：D0H, 06H, A0H, <X coordinate>, <Y coordinate>, <inch/cm>

■ Status information

- **Microphone beam steering position information**

AM-CF1 notifies the current microphone beam steering position.

AM-CF1 Response：AM-CF1 D0H, 06H, A0H, <X coordinate>, <Y coordinate>, <inch/cm>

<X coordinate>（-600.0 to 600.0[cm/inch]）

An integer of two bytes with signs, expressed in big-endian decimal places.

<inch/cm> For inch: -2400 to 2400 [inch per 10 units]（-240.0 to 240.0 [inch]）

<inch/cm> For cm: -6000 to 6000 [cm/10 units]（-600.0 to 600.0 [cm]）

<Y coordinate>（0.0 to 600.0[cm/inch]）

An unsigned two-byte integer expressed in big-endian decimal places.

<inch/cm> For inch: 0 to 2400 [inch per 10 units]（0.0 to 240.0 [inch]）

<inch/cm> For cm: 0 to 6000 [cm/10 units]（0.0 to 600.0 [cm]）

<inch/cm>

00H: inch

01H: cm

（e.g.）Beam steering position information: Notification X-coordinate-300.0 cm, Y-coordinate 600.0 cm

D0H, 06H, A0H, F4H, 48H, 17H, 70H, 01H

■ Command List

Function	Command
Log-in	80H, 20H, <User Name>, <Password>
Log-out	81H, 00H
Speaker output gain setting （absolute position）	91H, 03H, <Channel Attribute>, <Channel Number>, <Position>
Speaker output gain setting （step）	91H, 03H, <Channel Attribute>, <Channel Number>, <Step>
Mute mode setting	98H, 03H, <Channel Attribute>, <Channel Number>, <ON/OFF >
Recalling memory presets	F1H, 02H, 00H, <Preset Number>
Standby mode setting	F3H, 02H, 00H, <Standby mode>
Bluetooth mode setting	F5H, 02H, 00H, <ON/OFF.
Microphone beam steering setting	A0H, 05H, <Auto/Manual>, <Direction>, <Distance>, <inch/cm>
Status notification setting	F2H, 02H, 00H, <ON/OFF >
Microphone beam steering status notification setting	F2H, 04H, 01H, <Interval>, <inch/cm>, <ON/OFF>
Status request（gain position）	F0H, 03H, 11H, <Channel Attribute>, <Channel Number>
Status request（mute mode）	F0H, 03H, 18H, <Channel Attribute>, <Channel Number>
Status request（memory preset number）	F0H, 02H, 71H, 00H
Status request（standby mode）	F0H, 02H, 72H, 00H
Status request（Bluetooth mode）	F0H, 02H, 74H, 00H
Status request（microphone beam steering setting）	F0H, 05H, 20H, 00H, 00H, 00H, 00H
Status request（microphone beam steering position）	F0H, 06H, 50H, 00H, 00H, 00H ,00H, <inch/cm>
Microphone beam steering position information	D0H, 06H, A0H, <X coordinate>, <Y coordinate>, <inch/cm>

■ Communication Examples

Function	Command	AM-CF1 Response
Log-in（admin, admin）	80H,20H,61H,64H,6DH,69H,6EH,00H, 00H,00H,00H,00H,00H,00H,00H,00H, 00H,00H,61H,64H,6DH,69H,6EH,00H, 00H,00H,00H,00H,00H,00H,00H,00H, 00H,00H	80H,01H,01H For NACK responses, the third byte is 00H
Log-out	81H,00H	81H,00H
Speaker output gain setting（0dB）	91H,03H,01H,00H,3DH	91H,03H,01H,00H,3DH
Speaker output gain setting（3 step up）	91H,03H,01H,00H,43H	91H,03H,01H,00H,2DH When 2AH（-19dB） before 3stepup, become 2DH after 3stepup
Speaker output gain setting（3 step down）	91H,03H,01H,00H,63H	91H,03H,01H,00H,2AH When 2DH（-16dB） before 3stepdown, become 2AH after 3stepdown
Mute mode setting（ON）	98H,03H,00H,00H,01H	98H,03H,00H,00H,01H
Mute mode setting（OFF）	98H,03H,00H,00H,00H	98H,03H,00H,00H,00H
Recalling memory presets（preset1）	F1H,02H,00H,00H	F1H,02H,00H,00H
Recalling memory presets（preset2）	F1H,02H,00H,01H	F1H,02H,00H,01H
Standby mode setting（ON）	F3H,02H,00H,01H	F3H,02H,00H,01H
Standby mode setting（OFF）	F3H,02H,00H,00H	F3H,02H,00H,00H
Bluetooth mode setting（ON）	F5H,02H,00H,01H	F5H,02H,00H,01H
Bluetooth mode setting（OFF）	F5H,02H,00H,00H	F5H,02H,00H,00H
Microphone beam steering setting（Auto）	A0H,05H,00H,00H,00H,00H,00H	A0H,05H,00H,00H,00H,00H,00H The position is notified by the beam steering position information command every set time. D0H,06H,A0H,F4H,48H,17H,70H,01H
Microphone beam steering setting（Manual, 90deg, 240.0inch）	A0H,05H,01H,A6H,09H,60H,00H	A0H,05H,01H,A6H,09H,60H,00H The position is notified by the microphone beam steering position information command.
Status notification setting（ON）	F2H,02H,00H,01H	F2H,02H,00H,01H
Status notification setting（OFF）	F2H,02H,00H,00H	F2H,02H,00H,00H
Microphone beam steering status notification setting（ON）	F2H,04H,01H,00H,00H,01H	F2H,04H,01H,00H,00H,01H
Microphone beam steering status notification setting（OFF）	F2H,04H,01H,00H,00H,00H	F2H,04H,01H,00H,00H,00H

■ Gain Table

Position		Gain（dB）	Position		Gain（dB）
00H	0	-∞	20H	32	-29
01H	1	-60	21H	33	-28
02H	2	-59	22H	34	-27
03H	3	-58	23H	35	-26
04H	4	-57	24H	36	-25
05H	5	-56	25H	37	-24
06H	6	-55	26H	38	-23
07H	7	-54	27H	39	-22
08H	8	-53	28H	40	-21
09H	9	-52	29H	41	-20
0AH	10	-51	2AH	42	-19
0BH	11	-50	2BH	43	-18
0CH	12	-49	2CH	44	-17
0DH	13	-48	2DH	45	-16
0EH	14	-47	2EH	46	-15
0FH	15	-46	2FH	47	-14
10H	16	-45	30H	48	-13
11H	17	-44	31H	49	-12
12H	18	-43	32H	50	-11
13H	19	-42	33H	51	-10
14H	20	-41	34H	52	-9
15H	21	-40	35H	53	-8
16H	22	-39	36H	54	-7
17H	23	-38	37H	55	-6
18H	24	-37	38H	56	-5
19H	25	-36	39H	57	-4
1AH	26	-35	3AH	58	-3
1BH	27	-34	3BH	59	-2
1CH	28	-33	3CH	60	-1
1DH	29	-32	3DH	61	0
1EH	30	-31	3EH	62	0
1FH	31	-30	3FH	63	0

Default value is 3DH

Position 00H is replaced to -60dB

Revision History

Ver.	Date of revision	Contents of establishment and change
0.0.1	March 23, 2018	1st revision released
1.0.0	May 7, 2018	The item of “speaker mute” is added.
1.0.1	May 23, 2018	The communication example is corrected according to the command sequence. Example of channel fader gain is modified. The explanation of switching for standby mode is corrected
1.0.2	May 28, 2018	The AM-CF1 response commands in "Communication example: 3stepdown" are corrected.
1.0.3	June 25, 2018	The mute mode setting speaker is added. Default value （OFF） for status notification setting AM-CF1 is added. Status request （mute mode） speaker is added.
1.0.4	July 23, 2018	Log-in and log-out are added. Status request （beam steering） is added.
1.0.5	August 1, 2018	The following communication commands examples are corrected. ・Mute mode setting ・Standby mode setting ・Status request （standby mode） ・Status request （beam steering） The Preset Setting name of the communication example is modified.
1.0.6	August 21, 2018	The status request （beam steering） is changed to the beam steering setting.
1.0.7	September 5, 2018	Microphone beam steering setting is changed. Beam steering status notification setting is added. Status request（beam steering setting）is added. Status request（beam steering position）is added. Beam steering position information is added. Command List Beam Steering is changed. Communication example Beam Steering is changed.
1.0.8	July 11, 2019	“*Note” description is deleted from the top page. Command Configuration description is changed. Data length of log-out is corrected. Description for speaker output gain setting（absolute position）is corrected. Example data of speaker output gain setting（step）is corrected. Description for microphone bean steering setting is corrected. Description for microphone bean steering status notification setting is corrected. Description for status request（microphone beam steering position）is corrected. X-coordinate of microphone beam steering position information is corrected in status request. Command description in Command List is corrected.
1.0.9	July 12, 2019	A part of descriptions for speaker output gain setting（absolute position）is deleted. A part of descriptions for Gain table is deleted.
1.0.10	November 6,2019	Bluetooth mode setting is added. Status request（Bluetooth mode）is added.