FOR.A ®
INNOVATIONS IN VIDEO
and AUDIO TECHNOLOGY

OPERATION MANUAL

MFR-8000
Multi Format Routing Switcher

MFR-GPI
MFR-TALM

8th Edition - Rev. 1

FOR-A COMPANY LIMITED

Edition Revision History

Edit.	Rev.	Date	Description	Section/Page
1	-	2014/07/02		
2	-	2014/07/23	Supported MFR-16DTIO cards	Sec. 2-5, etc.
3	-	2014/11/05	Enabled group button assignments Added 2-way Lock buttons (by short and long press) Added serial control commands.	Sec. 5-2-2 Sec. 5-3 to 5-5 Sec. 7-3
4	-	2015/01/26	MFR-16RUTA supported Changed control command description Corrected factual errors.	Sec. 7-3
5	-	2015/06/26	Added Switcher's AUX Crosspoints Switching. Added Destination Lock Status Request Command. Notes on button labels deletec (uploaded to the HP)	Sec. 3-4 Sec. 7-3-5 Appendix
6	-	2015/11/11	MFR-18RUA/39RUA supported	
6	1	2016/04/05	LAN control command added (signal name import)	7-3
7	-	2016/07/07	MFR-16AAIEX/16AAOEX supported	Secs. 2-1, 2-2, 2-4-2, 2-4-3, 9-1-1
7	1	2016/09/06	Changed control Command description	Sec. 7-3
8	-	2017/12/11	Switcher AUX switching supported (HVS-100/110, HVS-2000). Gearbox (MFR-16SDIGB/SDOGB) supported. Deleted MFR-RU Series to separate operation manual. Deleted Installing the AC Cord Retaining Clip.	Secs. 3-3, 3-4 Secs. 2-1, 2-2, 2-3, 8
8	1	2018/04/04	Added Payload ID & 3G-SDI BNC Output Setting Added System Size Request Command Added Video Format Command Deleted AC adapters from consumable lists.	Secs. 5-3-5, 5-3-6 Sec. 6-3-7 Sec. 6-3-8 Secs. 8-1-2, 8-1-3

Precautions

Important Safety Warnings

[Power]

Caution	Operate unit **only** at the specified supply voltage.
	Disconnect the power cord via the power plug only. **Do not** pull on the cable portion.
Stop	**Do not** place or drop heavy or sharp-edged objects on the power cord. A damaged cord can cause fire or electrical shock hazards. Regularly check the power cord for excessive wear or damage to avoid possible fire / electrical hazards.
Caution	**Ensure** the power cord is firmly plugged into the AC outlet.

[Grounding]

Caution	**Ensure** the unit is properly grounded at all times to prevent electrical shock.
Hazard	**Do not** ground the unit to gas lines, units, or fixtures of an explosive or dangerous nature.

[Operation]

Hazard	**Do not** operate the unit under hazardous or potentially explosive atmospheric conditions. Doing so could result in fire, explosion, or other hazardous results.
Hazard	**Do not** allow liquids, metal pieces, or other foreign materials to enter the unit. Doing so could result in fire, other hazards, or a unit malfunction.
	If a foreign material does enter the unit, turn the power off and **immediately** disconnect the power cord. Remove the material and contact an authorized service representative if damage has occurred.

[Transportation]

Caution	**Handle** with care to avoid impact shock during transit, which may cause malfunction. When you need to transport the unit, use the original or suitable alternative packing material.

[Circuitry Access]

	Do not remove covers, panels, casing, or access the circuitry with power applied to the unit. Turn the power off and disconnect the power cord prior to removal. Internal servicing / adjustment of unit should only be performed by qualified personnel.
Stop	**Do not** touch any parts / circuitry with a high heat factor. Capacitors can retain enough electric charge to cause mild to serious shock, even after the power has been disconnected. Capacitors associated with the power supply are especially hazardous.
Hazard	Unit **should not** be operated or stored with cover, panels, and / or casing removed. Operating the unit with circuitry exposed could result in electric shock / fire hazards or a unit malfunction.

[Potential Hazards]

Caution	If abnormal odors or noises are noticed coming from the unit, immediately turn the power off and disconnect the power cord to avoid potentially hazardous conditions. If problems similar to the above occur, contact an authorized service representative **before** attempting to operate the unit again.

[Rack Mount Brackets, Ground Terminal, and Rubber Feet]

Caution	To rack-mount or ground the unit, or to install rubber feet, **do not** use screws or materials other than those supplied. Doing so may cause damage to the internal circuits or components of the unit. If you remove the rubber feet that are attached to the unit, **do not** reinsert the screws that secure the rubber feet.

[Consumables]

Caution	Consumable items that are used in the unit must be periodically replaced. For further details on which parts are consumables and when they should be replaced, refer to the specifications at the end of the Operation Manual. Since the service life of the consumables varies greatly depending on the environment in which they are used, such items should be replaced at an early date. For details on replacing consumable items, contact your dealer.

Upon Receipt

Unpacking

MFR-8000 units and their accessories are fully inspected and adjusted prior to shipment. Operation can be performed immediately upon completing all required connections and operational settings.

Check your received items against the packing lists below. Check to ensure no damage has occurred during shipment. If damage has occurred, or items are missing, inform your supplier immediately.

◆ **Main Unit**

ITEM	QTY	REMARKS
MFR-8000	1	
AC Cord	1 set	AC cable and retaining clip
Rack Mount Brackets	1 set	EIA standard type (Attached to unit.)
CD-ROM	1	MFR-8000 Operation manual (PDF) Web-based Control Operation manual (PDF) MFR-RU Series Operation manual (PDF)
Quick Setup Guide	1	

◆ **Input / Output Cards**

ITEM	QTY	REMARKS
MFR-16SDIA	1 – 16 *	16 SDI input card
MFR-16SDO	1 – 16 *	16 SDI output card
MFR-16ADI	1 – 4 *	Digital audio input card with SRC (AES/EBU 16 stereo pairs)
MFR-16AAI	1 – 4 *	Analog audio input card with A/D converter (Analog 16 stereo pairs)
MFR-16ADAO	1 – 8 *	Audio output card with D/A converter (AES/EBU 8 stereo pairs) (SDI x 2 8 stereo pairs) (ANALOG 4 stereo pairs)
MFR-16AESI	1 – 16 *	Digital audio input card (AES/EBU 16 stereo pairs)
MFR-16AESO	1 – 16 *	Digital audio output card (AES/EBU 16 stereo pairs)
MFR-16DTIO	1 – 8 *	RS-422 data I/O card (16 D-sub 9-pin connectors)
MFR-16AAIEX	1 – 4 *	Analog audio input card with A/D converter (Analog 16 stereo pairs)
MFR-16AAOEX	1 – 4 *	Analog audio output card with D/A converter (Analog 16 stereo pairs)
MFR-16SDIGB	1 –	16 SDI input card (Gearbox 4ch built-in)
MFR-16SDOGB	1 –	16 SDI output card (Gearbox 4ch built-in)

* The number of installed cards varies depending on the system configuration. See the Matrix Size Chart on page 12

◆ **Option (for MFR-8000)**

ITEM	QTY	REMARKS
MFR-CPU	1	Redundant CPU card *
MFR-PS	1 set	Redundant power supply unit (with AC cord and AC cord retaining clip.)
MFR-18RUA/39RUA MFR-39RU/40RU/18RU MFR-16RU/16RUD/16RUTA MFR-16/32/64RUW	1	Remote Control Unit

◆ **Interface Expansion Unit**

ITEM	QTY	REMARKS
MFR-GPI	1	
AC Adaptor *	1	With DC lock plug
AC cable	1	
Rack Mount Brackets	1 set	EIA standard type
LAN Cable (straight)	1	

* Depending on the production date, AC adapter is supplied without DC lock plug, but with a DC cable retaining clip.

◆ **Tally Manager Unit**

ITEM	QTY	REMARKS
MFR-TALM	1	
AC Adaptor *	1	With DC lock plug
AC cable	1	
Rack Mount Brackets (optional)	1 set	Single- or Dual-unit type EIA standard type

* Depending on the production date, AC adapter is supplied without DC lock plug, but with a DC cable retaining clip.

Font Conventions

The following conventions are used throughout this manual:

● Shaded text (such as ON) indicates **parameter values** in the menu.
● Text enclosed by a square (such as ALARM, MODE) indicates **front panel buttons** on the MFR-8000 or Remote Control Units.
● References to the MFR Series Web-based Control Software are indicated by [Web-based Control: XXX page].

Table of Contents

1. Prior to Starting

1-1. Welcome

Congratulations! By purchasing an MFR-8000 Multi Format Routing Switcher (hereafter called MFR main unit) you have entered the world of FOR-A and its many innovative products. We thank you for your patronage and hope you will turn to FOR-A products again and again to satisfy your video and audio needs.

FOR-A provides a wide range of products, from basic support units to complex system controllers, which have been increasingly joined by products for computer video-based systems. Whatever your needs, talk to your FOR-A representative. We will do our best to be of continuing service to you.

1-2. Features

The MFR-8000 is a multi-format routing switcher that supports 12G-SDI, 3G-SDI, HD-SDI, SD-SDI, ASI, and AES video / audio signals as well as RS-422 data signals. Inside the 16U case a matrix of up to 256 inputs/256 outputs can be configured. And by linking multiple cases, they can be used as a large-scale routing switcher. It supports various functions such as the capability of linking multiple cases, tally connections with peripheral devices, and automatic source name tracking, to allow the units to be the core product in small to medium size systems.

➢ Support for **3G-SDI**, **HD-SDI**, **SD-SDI**, **ASI** and **RS-422 data** signals with automatic signal recognition that enables operation without concern for the type of signal. Changing the input/output card enables support for **12G-SDI** and **AES** signals.
➢ **Parallel link** enabling two simultaneous main unit control
➢ One routing switcher can be **virtually partitioned** to build any theoretical hierarchy, which creates possibilities for use in various operating forms.
➢ Various crosspoint control functions such as **Salvo**, **Take**, **Link**, **Level** operation, and **Chop**
➢ **Tally linking** with FOR-A's video switchers (HANABI Series) and multi viewers. Source name displays on video switchers and multi viewers can be switched in conjunction with switchings controlled in the main unit. MFR routers support TSL and Harris protocol, enabling linkage to other companies' products.
➢ Built-in webserver for **remote control** through a web browser
➢ **SNMP support** enabling SNMP monitoring system configuration
➢ **Status monitoring** for power supply, fan, CPU, SDI input/output, etc.
➢ **CPU board redundancy** allowing monitoring of primary CPU board operation via the secondary board.
  Immediate and smooth switch over to the secondary board without down time in case of irregularities, as well as stable remote control operation supported by **the network redundancy**
➢ **Power unit redundancy** for stable power supply against power unit failure or power supply troubles
➢ LED display on the main unit front that can display settings and alarms enabling the main unit to take over operation in the event the remote environment goes down.
➢ Designed for maintainability, all boards and power units can be accessed from the front without removing any cables connected in back.
➢ Matrix partition and level setting capabilities support a flexible control environment (maximum of 128 units in total including the main unit)
➢ Remote control panel connectivity for configuring a huge control panel
➢ Interface expansion unit (**MFR-GPI**) for additional 128 (32 x 4) GPI/O and 4 serial ports (9-pin D-sub, male)
➢ **MFR-TALM** Tally Manager Unit is designed specifically to manage tally and signal name data in the MFR system and the exchange of this data with external devices such as a video switcher, multiviewer etc.. The unit performs the task of tally data computation, which is ordinarily undertaken by the MFR main unit, to accelerate the task.
➢ Conversions between 12G-SDI and Quad Link 3G-SDI and between 2SI and SQD available by installing optional **MFR-16SDIGB** and **MFR-16SDOGB** (Gearbox feature built-in) cards.

2. Panel Descriptions

2-1. MFR-8000 Front Panel
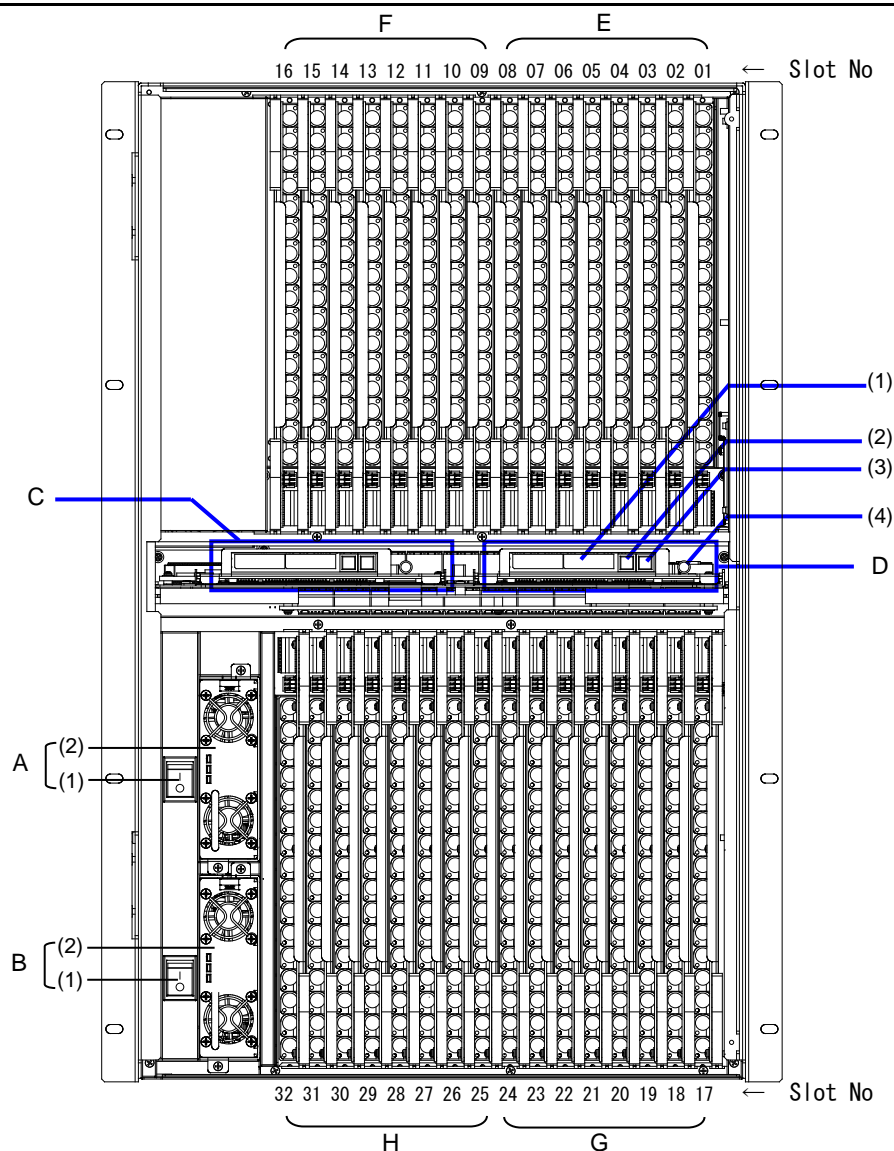
No.	Name	Description
A	POWER1	Power switch 1 (standard equipment) (1) Switch to turn unit power On/Off. (2) DC power supply voltage indication LED (Normal: lit green / Error: unlit)
B	POWER2 (*1)	Power switch 2 (optional equipment) (1) and (2) the same as POWER1.
C	CPU1	CPU card (standard equipment/Primary CPU) (1) Displays settings and alarms (2) Alarm button to enter the ALARM menu. Effective during an alarm. (ALARM button) (The LED lights red in an alarm.) (3) Cancel button for menu settings. (ACTIVE/BUS button) (The LED lights green when active) (4) Used for menu operation (CONTROL knob) * See section 4 "Settings via MFR-8000 Menus" for details on the menu operation.
D	CPU2	CPU card (optional/Secondary CPU) (1) to (4) are the same as CPU1.

(*1)When installing the second power supply unit, be sure to set PS2 INSTALL to INSTALLED under SETTING > MU SETTING > PS2 INSTALL in the CPU card front menu. (See section 4. "Settings via MFR-8000 Menus")

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◆ Input / Output Card Slots

No.	Slot	Video Card	Audio Card	16DTIO Card [*3]
E	INPUT 1 - 4 (No. 01 - 04)	16SDIA: Max. 4 cards	16AESI: Max. 4 cards	No. 02, 04 Max. 2 cards
E	INPUT 5 - 8 (No. 05 - 08)	16SDIA: Max. 4 cards	16ADI: Max. 4 cards 16AAI: Max. 4 cards 16AAIEX: Max. 4 cards 16AESI: Max. 4 cards	No. 06, 08 Max. 2 cards
F	OUTPUT 1 - 8 (No. 09 - 16)	16SDO: Max. 8 cards	16ADAO: Max. 8 cards 16AAOEX: Max. 4 cards [*2] 16AESO: Max. 8 cards	No. 10, 12, 14, 16 Max. 4 cards
G	INPUT 9 - 16 (No. 17 - 24)	16SDIA: Max. 8 cards	16AESI: Max. 8 cards	No. 17, 19, 21, 23 Max. 4 cards
H	OUTPUT 9 - 16 (No. 25 - 32)	16SDO: Max. 8 cards	16AAOEX: Max. 4 cards [*2] 16AESO: Max. 8 cards	No. 25, 27, 29, 31 Max. 4 cards

(*2)A total of up to **4** MFR-16AAOEX cards can be installed in **Slot No. 09 to 16** and **25 to 32**.
(*3)A total of up to **8** MFR-16DTIO cards can be installed in the slots highlighted in green in the figure below.

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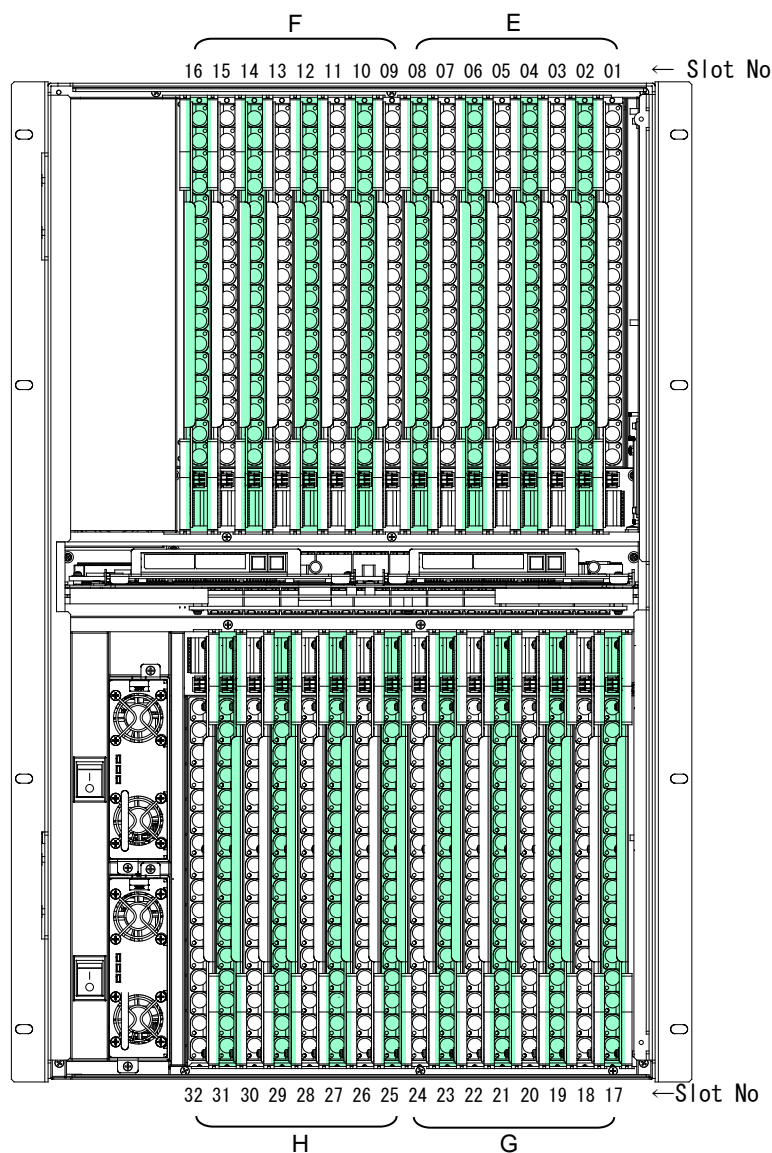
2-1-1. Matrix Size Chart

◆ **Standard SDI Signal Routing**

Matrix size varies depending on the number of installed MFR-16SDIA and MFR-16SDO cards as shown below. (256 x 256 to 16 x 16)

		Number of cards: MFR-16SDO														
		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Number of cards: MFR-16SDIA	16	256 x 256	256 x 240	256 x 224	256 x 208	256 x 192	256 x 176	256 x 160	256 x 144	256 x 128	256 x 112	256 x 96	256 x 80	256 x 64	256 x 48	256 x 32	256 x 16
	15	240 x 256	240 x 240	240 x 224	240 x 208	240 x 192	240 x 176	240 x 160	240 x 144	240 x 128	240 x 112	240 x 96	240 x 80	240 x 64	240 x 48	240 x 32	240 x 16
	14	224 x 256	224 x 240	224 x 224	224 x 208	224 x 192	224 x 176	224 x 160	224 x 144	224 x 128	224 x 112	224 x 96	224 x 80	224 x 64	224 x 48	224 x 32	224 x 16
	13	208 x 256	208 x 240	208 x 224	208 x 208	208 x 192	208 x 176	208 x 160	208 x 144	208 x 128	208 x 112	208 x 96	208 x 80	208 x 64	208 x 48	208 x 32	208 x 16
	12	192 x 256	192 x 240	192 x 224	192 x 208	192 x 192	192 x 176	192 x 160	192 x 144	192 x 128	192 x 112	192 x 96	192 x 80	192 x 64	192 x 48	192 x 32	192 x 16
	11	176 x 256	176 x 240	176 x 224	176 x 208	176 x 192	176 x 176	176 x 160	176 x 144	176 x 128	176 x 112	176 x 96	176 x 80	176 x 64	176 x 48	176 x 32	176 x 16
	10	160 x 256	160 x 240	160 x 224	160 x 208	160 x 192	160 x 176	160 x 160	160 x 144	160 x 128	160 x 112	160 x 96	160 x 80	160 x 64	160 x 48	160 x 32	160 x 16
	9	144 x 256	144 x 240	144 x 224	144 x 208	144 x 192	144 x 176	144 x 160	144 x 144	144 x 128	144 x 112	144 x 96	144 x 80	144 x 64	144 x 48	144 x 32	144 x 16
	8	128 x 256	128 x 240	128 x 224	128 x 208	128 x 192	128 x 176	128 x 160	144 x 144	128 x 128	128 x 112	128 x 96	128 x 80	128 x 64	128 x 48	128 x 32	128 x 16
	7	112 x 256	112 x 240	112 x 224	112 x 208	112 x 192	112 x 176	112 x 160	112 x 144	112 x 128	112 x 112	112 x 96	112 x 80	112 x 64	112 x 48	112 x 32	112 x 16
	6	96 x 256	96 x 240	96 x 224	96 x 208	96 x 192	96 x 176	96 x 160	96 x 144	96 x 128	96 x 112	96 x 96	96 x 80	96 x 64	96 x 48	96 x 32	96 x 16
	5	80 x 256	80 x 240	80 x 224	80 x 208	80 x 192	80 x 176	80 x 160	80 x 144	80 x 128	80 x 112	80 x 96	80 x 80	80 x 64	80 x 48	80 x 32	80 x 16
	4	64 x 256	64 x 240	64 x 224	64 x 208	64 x 192	64 x 176	64 x 160	64 x 144	64 x 128	64 x 112	64 x 96	64 x 80	64 x 64	64 x 48	64 x 32	64 x 16
	3	48 x 256	48 x 240	48 x 224	48 x 208	48 x 192	48 x 176	48 x 160	48 x 144	48 x 128	48 x 112	48 x 96	48 x 80	48 x 64	48 x 48	48 x 32	48 x 16
	2	32 x 256	32 x 240	32 x 224	32 x 208	32 x 192	32 x 176	32 x 160	32 x 144	32 x 128	32 x 112	32 x 96	32 x 80	32 x 64	32 x 48	32 x 32	32 x 16
	1	16 x 256	16 x 240	16 x 224	16 x 208	16 x 192	16 x 176	16 x 160	16 x 144	16 x 128	16 x 112	16 x 96	16 x 80	16 x 64	16 x 48	16 x 32	16 x 16

◆ **AUDIO Signal Routing**

Matrix size varies depending on the number of installed MFR-16ADI, MFR-16AAI and MFR-16ADAO cards as shown below. (1 stereo pair = 2 channels)

		Number of cards: MFR-16ADAO							
		8	7	6	5	4	3	2	1
Number of cards: MFR-16ADI or MFR-16AAI	4	64 x 64	64 x 56	64 x 48	64 x 40	64 x 32	64 x 24	64 x 16	64 x 8
	3	48 x 64	48 x 56	48 x 48	48 x 40	48 x 32	48 x 24	48 x 16	48 x 8
	2	32 x 64	32 x 56	32 x 48	32 x 40	32 x 32	32 x 24	32 x 16	32 x 8
	1	16 x 64	16 x 56	16 x 48	16 x 40	16 x 32	16 x 24	16 x 16	16 x 8

Matrix size varies depending on the number of installed MFR-16AESI, MFR-16AESO, MFR-16AAIEX and MFR-16AAOEX cards as shown below. (1 stereo pair = 2 channels)
* Up to 4 MFR-16AAIEX and MFR-16AAOEX cards can be installed.

		Number of cards: MFR-16AESO or MFR-16AAOEX															
		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Number of cards: MFR-16AESI or MFR-16AAIEX	16	256 x 256	256 x 240	256 x 224	256 x 208	256 x 192	256 x 176	256 x 160	256 x 144	256 x 128	256 x 112	256 x 96	256 x 80	256 x 64	256 x 48	256 x 32	256 x 16
	15	240 x 256	240 x 240	240 x 224	240 x 208	240 x 192	240 x 176	240 x 160	240 x 144	240 x 128	240 x 112	240 x 96	240 x 80	240 x 64	240 x 48	240 x 32	240 x 16
	14	224 x 256	224 x 240	224 x 224	224 x 208	224 x 192	224 x 176	224 x 160	224 x 144	224 x 128	224 x 112	224 x 96	224 x 80	224 x 64	224 x 48	224 x 32	224 x 16
	13	208 x 256	208 x 240	208 x 224	208 x 208	208 x 192	208 x 176	208 x 160	208 x 144	208 x 128	208 x 112	208 x 96	208 x 80	208 x 64	208 x 48	208 x 32	208 x 16
	12	192 x 256	192 x 240	192 x 224	192 x 208	192 x 192	192 x 176	192 x 160	192 x 144	192 x 128	192 x 112	192 x 96	192 x 80	192 x 64	192 x 48	192 x 32	192 x 16
	11	176 x 256	176 x 240	176 x 224	176 x 208	176 x 192	176 x 176	176 x 160	176 x 144	176 x 128	176 x 112	176 x 96	176 x 80	176 x 64	176 x 48	176 x 32	176 x 16
	10	160 x 256	160 x 240	160 x 224	160 x 208	160 x 192	160 x 176	160 x 160	160 x 144	160 x 128	160 x 112	160 x 96	160 x 80	160 x 64	160 x 48	160 x 32	160 x 16
	9	144 x 256	144 x 240	144 x 224	144 x 208	144 x 192	144 x 176	144 x 160	144 x 144	144 x 128	144 x 112	144 x 96	144 x 80	144 x 64	144 x 48	144 x 32	144 x 16
	8	128 x 256	128 x 240	128 x 224	128 x 208	128 x 192	128 x 176	128 x 160	144 x 144	128 x 128	128 x 112	128 x 96	128 x 80	128 x 64	128 x 48	128 x 32	128 x 16
	7	112 x 256	112 x 240	112 x 224	112 x 208	112 x 192	112 x 176	112 x 160	112 x 144	112 x 128	112 x 112	112 x 96	112 x 80	112 x 64	112 x 48	112 x 32	112 x 16
	6	96 x 256	96 x 240	96 x 224	96 x 208	96 x 192	96 x 176	96 x 160	96 x 144	96 x 128	96 x 112	96 x 96	96 x 80	96 x 64	96 x 48	96 x 32	96 x 16
	5	80 x 256	80 x 240	80 x 224	80 x 208	80 x 192	80 x 176	80 x 160	80 x 144	80 x 128	80 x 112	80 x 96	80 x 80	80 x 64	80 x 48	80 x 32	80 x 16
	4	64 x 256	64 x 240	64 x 224	64 x 208	64 x 192	64 x 176	64 x 160	64 x 144	64 x 128	64 x 112	64 x 96	64 x 80	64 x 64	64 x 48	64 x 32	64 x 16
	3	48 x 256	48 x 240	48 x 224	48 x 208	48 x 192	48 x 176	48 x 160	48 x 144	48 x 128	48 x 112	48 x 96	48 x 80	48 x 64	48 x 48	48 x 32	48 x 16
	2	32 x 256	32 x 240	32 x 224	32 x 208	32 x 192	32 x 176	32 x 160	32 x 144	32 x 128	32 x 112	32 x 96	32 x 80	32 x 64	32 x 48	32 x 32	32 x 16
	1	16 x 256	16 x 240	16 x 224	16 x 208	16 x 192	16 x 176	16 x 160	16 x 144	16 x 128	16 x 112	16 x 96	16 x 80	16 x 64	16 x 48	16 x 32	16 x 16

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NOTE
Refer to section 2-4. "Audio Input / Output Cards" for details on audio input and output cards.

◆ RS-422 Data Routing

Matrix size can be freely selected depending on the number of installed MFR-16DTIO cards, regardless of their slot location, as shown below.

Number of MFR-16DTIO cards	8	7	6	5	4	3	2	1
Number of RS-422 ports	128	112	96	80	64	48	32	16
Routing	Matrix size can be freely selected depending on the number of installed MFR-16DTIO cards, regardless of their slot location. RS-422 data can be routed between ports in the same card or different cards. See section 2-5. "RS-422 Data Input / Output Cards" for details on input and output port settings.							

2-1-2. Input / Output Card Installation and Removal

MFR cards should be installed by opening the MFR-8000 front panel. Remove the two screws on the front panel as shown below to open the front panel.
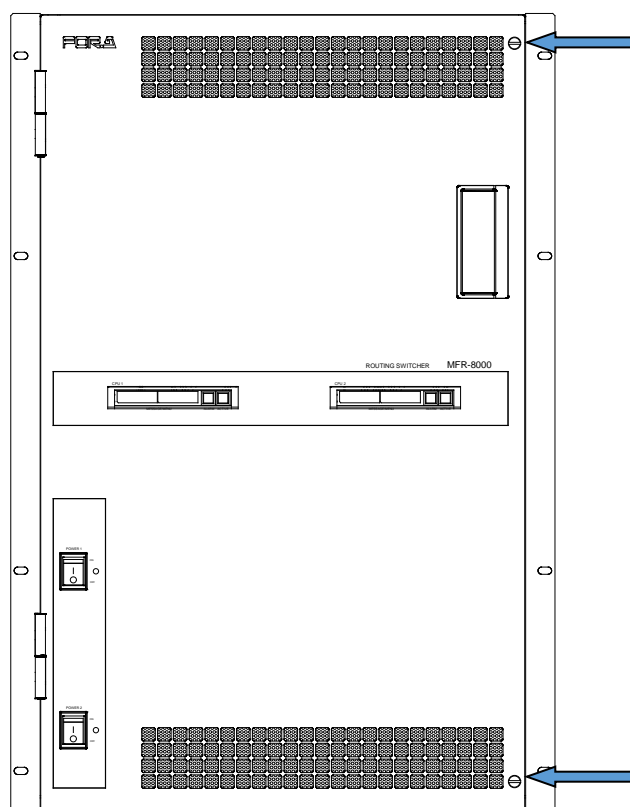
◆ Removing an MFR Input/Output card

To remove an input or output card with the MFR-8000 powered on, turn the power of the slot from which to remove the card OFF. Be sure to turn the power of the slot off before removing its card.

►See [SHUTDOWN] in section 4-5. "SETTINGS."

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◆ **Installing an MFR Input/Output card**

To install an MFR-16SDIA/SDO/ADI/ADAO card with the MFR-8000 powered on, turn the power of the slot on, using the front menu, after installing the card.
► See [SHUTDOWN] in section 4-5. "SETTINGS."

MFR I/O cards must be installed into their respective designated slots from the correct side.
►See section 2-1. "MFR-8000 Front Panel."

2-1-3. CPU Card Installation and Removal

CPU cards can be installed or removed with the MFR-8000 power turned on as shown below.

IMPORTANT
Do not touch any other parts on the card. Static electricity may damage sensitive electrical components on the card.

◆ **Removing a CPU card**
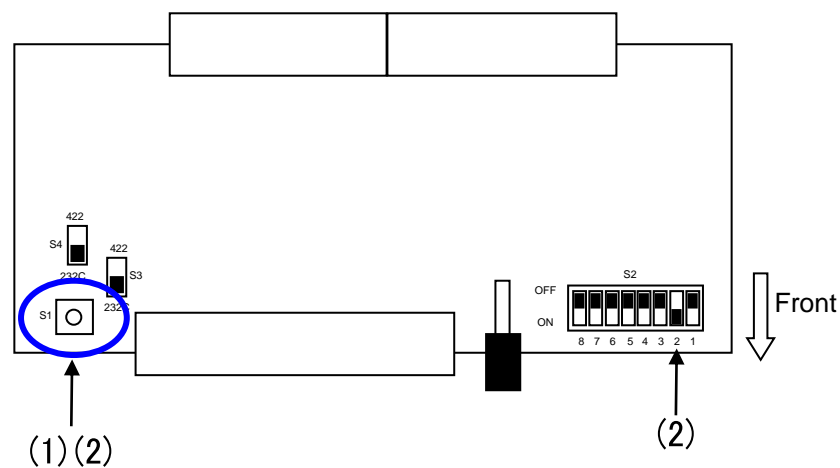
(1) Press the reset button (S1) on the CPU card.
(2) Repress and hold the button, then turn ON the switch 2 of Dipswitch S2.
(3) Release the button. The menu display will turn off automatically.
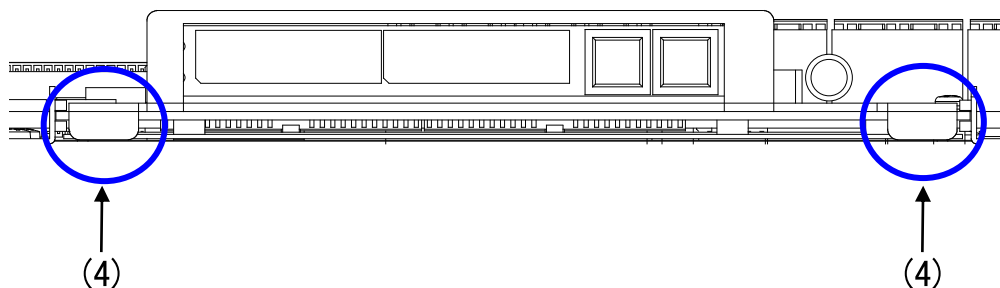
(4) Hold the two black handles at both sides on the CPU card and gradually remove the card from the chassis.

◆ Inserting a CPU card
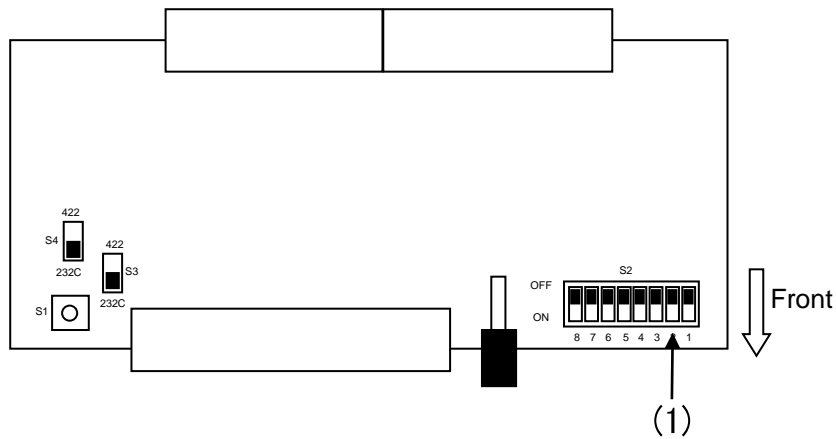
(1) Verify that the switch 2 of Dipswitch S2 on the card is turned OFF.
   If not, turn the switch to OFF.

ACTIVE/BUSY button
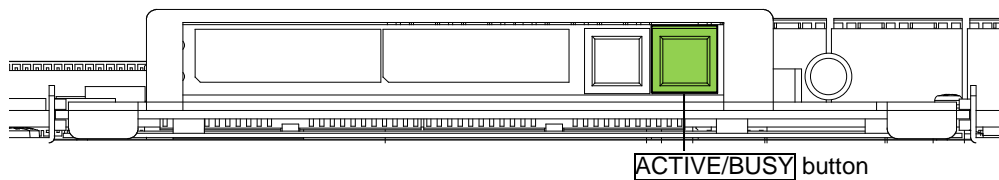
(2) If the installed CPU card is not active (ACTIVE/BUSY lights green.), wait for 20 seconds.
(3) Align a new CPU card with the slot guide rails and insert the card into the slot.
(4) Verify that the card is firmly installed.

2-1-4. CPU Card Switch Settings

IMPORTANT
Note that internal switch settings should only be performed by qualified technical personnel.

(1) Remove the two screws on the MFR-8000 front panel to remove the panel.
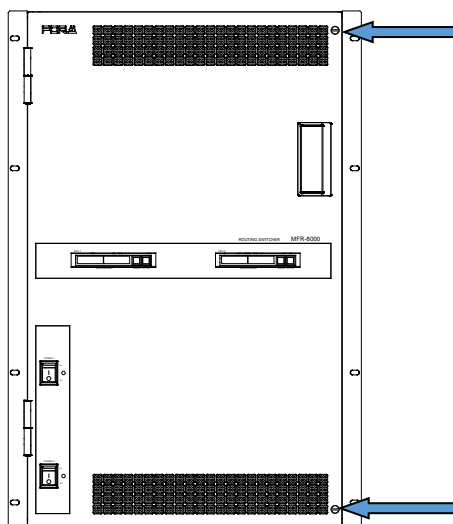
(2) The CPU card factory default settings are as shown below.

◆ **Switch settings**

Switch	Settings			
S1	Reset switch for the CPU card.			
S2	For maintenance use. Do not change these settings except when removing the CPU card. (Factory default settings are as shown in the right figure. The black squares (■) depict the switch positions.)	OFF ON		
S3, S4	Used to select RS-232C or RS-422. Make your selection referring to the right figures. Both switches must be set the same. CPU1 and CPU2 must use the same settings.	Switch settings	RS-232C (Factory default)	
			RS-422	

► See section 2-1-3. "CPU Card Installation and Removal" to remove a CPU card.

2-2. MFR-8000 Rear Panel
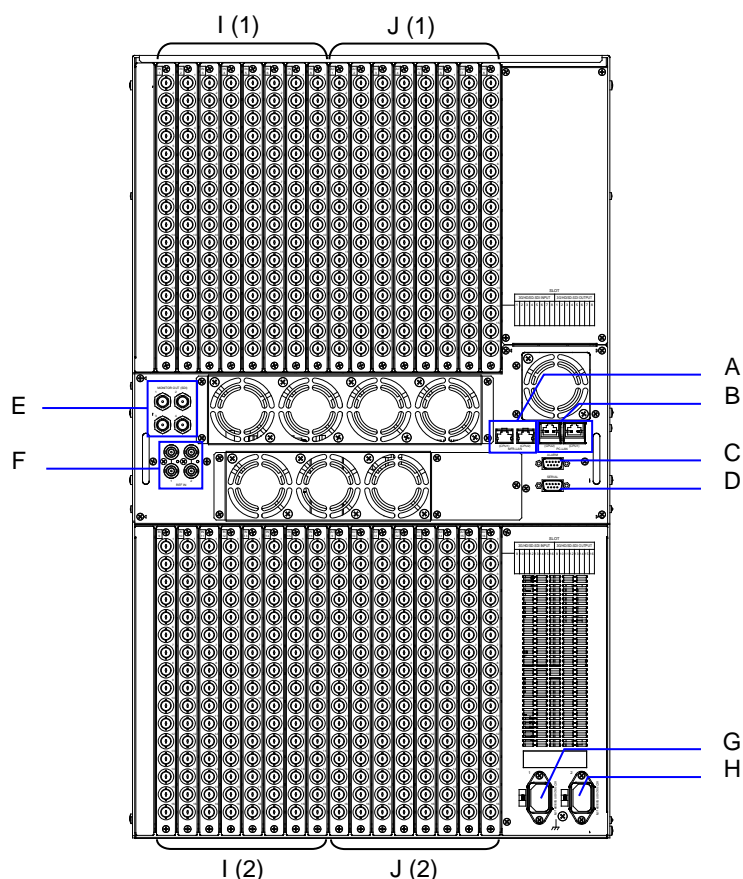
* The above figure shows an MFR-8000 with MFR-16SDIA and MFR-16SDO cards installed.

No.	Name	Description
A	MFR-LAN	For connection to MFR Remote Control Units and MFR-GPI Ethernet port (10/100/1000BASE-T) x 2 (for CPU 1 and CPU 2)
B	PC-LAN	For connection to PC or other external units Ethernet port (10/100BASE-TX) x 2 (for CPU 1 and CPU 2)
C	ALARM	Used for alarm output ► See section 2-2-1. "Interfaces."
D	SERIAL	Used for control via a serial interface. RS-232C or RS-422 selectable. ► See section 2-2-1. "Interfaces." The SERIAL connector is set to RS-232C as factory default. Consult your FOR-A reseller if you wish to change the setting.
E	MONITOR OUT 1 - 4	Used for monitor outputs (No automatic reclocking)
F	REF IN1, 2	Used to input reference signals (BB or Tri-level sync signal) (with loop-through. Terminate with 75Ω terminator, if unused.)
G	AC IN1	Used to connect Power Supply Unit 1 (standard equipment) to an AC power source
H	AC IN2	Used to connect Power Supply Unit 2 (optional) to an AC power source
I	INPUT	MFR-16SDIA/16SDIGB: Used to input digital component video signals MFR-16ADI: Used to input digital audio signals MFR-16AAI: Used to input analog audio signals MFR-16AAIEX: Used to input analog audio signals MFR-16AESI: Used to input digital audio signals ► See section 2-4. "Audio Input/Output Cards." MFR-16DTIO: Used to input/output RS-422 data signals ► See section 2-5. "RS-422 Data Input/Output Cards."

J	OUTPUT	MFR-16SDO/16SDOGB: Used to output digital component video signals MFR-16ADAO: Used to output digital/analog audio signals MFR-16AAOEX: Used to output analog audio signals MFR-16AESO Used to output digital audio signals ► See section 2-4. "Audio Input/Output Cards." MFR-16DTIO: Used to input/output RS-422 data signals ► See section 2-5. "RS-422 Data Input/Output Cards."

IMPORTANT
All 4 MFR-LAN and PC-LAN connectors (2 each) must be connected to their respective devices to enable CPU redundancy. The LAN connections for MFR Series devices must be separated from the network segment of other devices.

◆ **Cooling fan location**
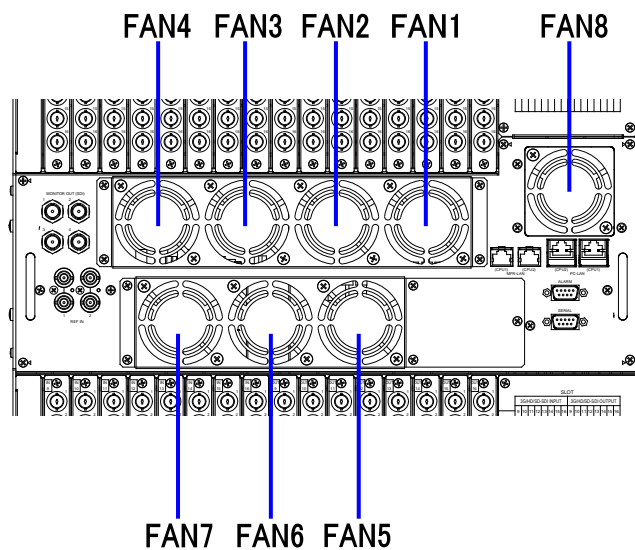
2-2-1. Interfaces

◆ **SERIAL Connector (9-pin D-sub, male)**
RS-232C or 422 interface can be selected via the CPU card DIP switches.

9-pin D-sub, male
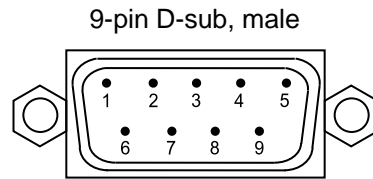
RS-232C Connector Pin Assignments

Pin No.	Signal Name	Description
1	NC	Not used
2	RxD	Received Data
3	TxD	Transmitted Data
4	DTR	Data Terminal Ready
5	SG	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	NC	Not used

* The maximum cable length is 10 m.
* DTR/DSR and RTS/CTS are internally connected respectively.

RS-422 connector pin assignment (9-pin, D-sub male)

Pin No.	Signal Name	Description
1	FG	Frame Ground
2	T-	Transmit data (-)
3	R+	Receive data (+)
4	SG	Signal Ground
5	NC	Unused
6	SG	Signal Ground
7	T+	Transmit data (+)
8	R-	Receive data (-)
9	FG	Frame Ground

* The maximum cable length is 100 m.

◆ ALARM Connector (9-pin D-sub, female)

Alarm 1 Out:

Under normal operation:	Pins 1 and 6 are open.
In a malfunction or power-off state:	Pins 1 and 6 are closed.

Alarm 2 Out:

Under normal operation:	Pins 2 and 7 are open.
In a malfunction or power-off state:	Pins 2 and 7 are closed.

Reset:
To reset the unit externally, short Pin 5 and a signal ground pin (8 or 9).
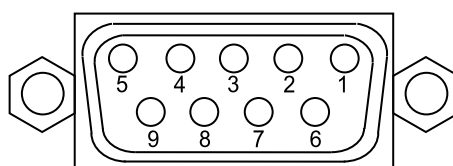
9-pin D-sub, female

ALARM Connector Pin Assignments

Pin No.	Signal Name	Description
1	ALARM 1 OUT	Alarm 1 output (Default setting: Fan)
2	ALARM 2 OUT	Alarm 2 output (Default setting: Power)
3	NC	Unused
4	NC	Unused
5	RESET IN	Reset in, active low
6	ALARM 1 COMMON	Alarm 1 output, common
7	ALARM 2 COMMON	Alarm 2 output, common
8	GND	Signal ground
9	GND	Signal ground

The following items can be set for ALARM1 OUT and ALARM2 OUT. The alarms can be assigned in the Web-Based Control.

Available alarm signals

Fan (including power unit cooling fans)
Power
Secondary CPU error
CPU Changeover (issued when the secondary CPU is activated to change over the operation)
Crosspoint Error

2-3. SDI Input/Output Cards

2-3-1. MFR-16SDIA

MFR-16SDIA is an SDI input card and can accept 16 of 3G/HD/SD-SDI and ASI signals.
Up to **16** cards can be installed into Slots **No. 01 to 08 and 17 to 24**.
► See section 2-1-1. "Matrix Size Chart."
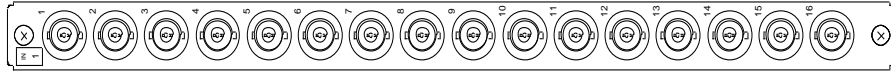
BNC x 16 inputs (3G/HD/SD-SDI or ASI signal auto-detection)

Set up input signals in the Web-based Control Software as shown below.

◆ Source Name
In the left side of the Web-based Control screen, click to select [**Router System Settings**] -
[**Source Name**] in the menu tree to display the setting page.
This page allows you to change source names displayed on Remote Controllers or other
devices.

◆ Source Assignment
Open the [Web-based Control: **Router System Settings - Source Assignment** page].
This page allows you to assign physical inputs to logical input channels.

2-3-2. MFR-16SDO

MFR-16SDO is an SDI output card and can output 16 of 3G/HD/SD-SDI and ASI signals.
Up to **16** cards can be installed into **Slot No. 09 to 16 and 25 to 32**.
► See section 2-1-1. "Matrix Size Chart."
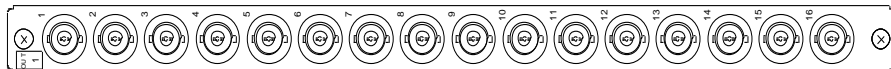
BNC x 16 outputs (3G/HD/SD-SDI or ASI signal depending on crosspoint selections)

Set up output signals in the Web-based Control Software as shown below.

◆ Destination Assignment
Open the [Web-based Control: **Router System Settings - Destination Assignment** page].
This page allows you to assign physical outputs to logical output channels.

◆ Destination Name
Open the [Web-based Control: **Router System Settings - Destination Name** page].
This page allows you to change destination names displayed on Remote Controllers.

2-3-3. MFR-16SDIGB

The MFR-16SDIGB is an SDI input card that accepts 12G- and 3G-SDI signals and supports Gearbox feature in which video signal conversions between 12G-SDI and Quad Link 3G-SDI, and between 2SI and SQD are available.
► See Sec. 5. "Gearbox Feature (MFR-16SDIGB/16SDOGB)."

The following numbers of inputs are available:
● 12G-SDI signal: Max 4 inputs (BNC: 1D, 2D, 3D and 4D)
● 3G-SDI signal: Max 16 inputs

Cards can be installed into **Slot No. 01 to 08**.
► See Sec. 2-1-1. "Matrix Size Chart."
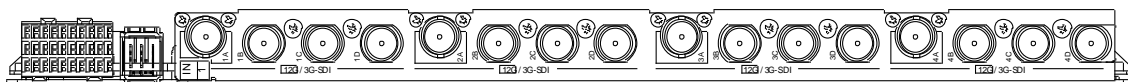
BNC x 16 inputs (12G/3G-SDI)

Set up input signals in the Web-based Control Software as shown below.

◆ **Gearbox settings**
In the left side of the Web-based Control screen, click to select [**(Main Unit Settings)** - **Gearbox Settings**] in the menu tree to display the settings page.
This page allows you to specify input signals and conversion modes.

◆ **Source Name**
In the left side of the Web-based Control screen, click to select [**Router System Settings**] - [**Source Name**] in the menu tree to display the settings page.
This page allows you to change source names displayed on Remote Controllers or other devices.

◆ **Source Assignment**
In the left side of the Web-based Control screen, click to select [**Router System Settings** - **Source Name**] in the menu tree to display the settings page.
This page allows you to assign physical inputs to logical input channels.

2-3-4. MFR-16SDOGB

The MFR-16SDOGB is an SDI output card that accepts 12G- and 3G-SDI signals and supports Gearbox features in which video signal conversions between 12G-SDI and Quad Link 3G-SDI, and between 2SI and SQD are available.
► See Sec. 5. "Gearbox Feature (MFR-16SDIGB/16SDOGB)."

The following numbers of outputs are available:
● 12G-SDI signal: Max 4 outputs (BNC: 1D, 2D, 3D and 4D)
● 3G-SDI signal: Max 16 outputs

Cards can be installed into **Slot No. 09 to 16**.
► See Sec. 2-1-1. "Matrix Size Chart."
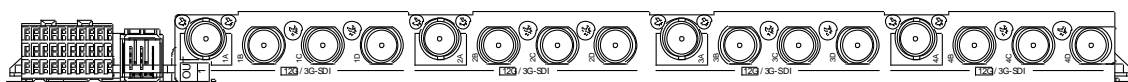
BNC x 16 outputs (12G/3G-SDI)

Set up output signals in the Web-based Control Software as shown below.

◆ **Gearbox settings**
In the left side of the Web-based Control screen, click to select [**(Main Unit Settings)** - **Gearbox Settings**] in the menu tree to display the settings page.
This page allows you to specify output signals and conversion modes.

◆ **Destination Assignment**
Open the [Web-based Control: **Router System Settings - Destination Assignment** page].
This page allows you to assign physical outputs to logical output channels.

◆ **Destination Name**
Open the [Web-based Control: **Router System Settings - Destination Name** page].
This page allows you to change destination names displayed on Remote Controllers.

2-4. Audio Input / Output Cards

Source and destination assignment procedures for audio signals are the same as those for SDI signals. Refer to the previous chapter. This chapter describes audio specific setup. Audio signals should be setup in the Web-based Control pages
► See [Web-based Control: **Audio Settings** page].

2-4-1. MFR-16AAI/16AAIEX (Analog Input)

MFR-16AAI/16AAIEX is an analog audio input card with A/D converter.
Up to **4** cards can be installed into **Slot No. 05 to 08**.
► See section 2-1-1. "Matrix Size Chart."
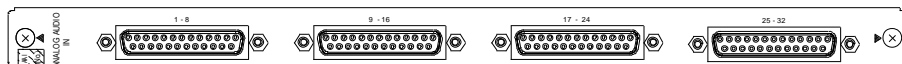
25-pin D-Sub (female) x 4 (16 stereo pairs, 32 channels), 600 Ohm or high impedance

IMPORTANT
When using an MFR-16AAI, a Black Burst signal should be input to REF IN2.

To output analog audio signals input to MFR-16AAI and MFR-16AAIEX, a compatible analog audio output card should be installed into the MFR main unit.

	MFR-16AAOEX	MFR-16ADAO	MFR-16AESO
MFR-16AAI	-	✓	-
MFR-16AAIEX	✓	-	✓

✓ : Compatible, -: Incompatible

◆ **Analog Audio Input**
Select the input impedance and adjust the input level per each stereo pair (2 channels) in the [Web-based Control: **Audio Settings** page].

Analog Input Terminal	Select 600 ohm or High impedance for analog input.
Analog Input Level	Adjust analog input level.

◆ Analog Audio Connection

For balanced audio signals, connect the **hot**, **cold** and **shield** conductor to "**+**" ," **-** " and "**COM**" pins respectively.

For unbalanced audio signals, connect the conductor that carries **audio** to a "**+**" pin and **ground** to "**COM.**"

Analog Audio Connector (25-pin D-sub, female, inch screws) x 4

Connector Pin Assignments

Channels 1 to 8

Pin No.	Setting	Pin No.	Setting
13	CH1 +	25	CH1 COM
12	CH1 -	24	CH2 +
11	CH2 COM	23	CH2 -
10	CH3 +	22	CH3 COM
9	CH3 -	21	CH4 +
8	CH4 COM	20	CH4 -
7	CH5 +	19	CH5 COM
6	CH5 -	18	CH6 +
5	CH6 COM	17	CH6 -
4	CH7 +	16	CH7 COM
3	CH7 -	15	CH8 +
2	CH8 COM	14	CH8 -
1	SG	-	-

Channels 9 to 16

Pin No.	Setting	Pin No.	Setting
13	CH9 +	25	CH9 COM
12	CH9 -	24	CH10 +
11	CH10 COM	23	CH10 -
10	CH11 +	22	CH11 COM
9	CH11 -	21	CH12 +
8	CH12 COM	20	CH12 -
7	CH13 +	19	CH13 COM
6	CH13 -	18	CH14 +
5	CH14 COM	17	CH14 -
4	CH15 +	16	CH15 COM
3	CH15 -	15	CH16 +
2	CH16 COM	14	CH16 -
1	SG	-	-

Channels 17 to 24

Pin No.	Setting	Pin No.	Setting
13	CH17 +	25	CH17 COM
12	CH17 -	24	CH18 +
11	CH18 COM	23	CH18 -
10	CH19 +	22	CH19 COM
9	CH19 -	21	CH20 +
8	CH20 COM	20	CH20 -

Pin No.	Setting	Pin No.	Setting
7	CH21 +	19	CH21 COM
6	CH21 -	18	CH22 +
5	CH22 COM	17	CH22 -
4	CH23 +	16	CH23 COM
3	CH23 -	15	CH24 +
2	CH24 COM	14	CH24 -
1	SG	-	-

Channels 25 to 32

Pin No.	Setting	Pin No.	Setting
13	CH25 +	25	CH25 COM
12	CH25 -	24	CH26 +
11	CH26 COM	23	CH26 -
10	CH27 +	22	CH27 COM
9	CH27 -	21	CH28 +
8	CH28 COM	20	CH28 -
7	CH29 +	19	CH29 COM
6	CH29 -	18	CH30 +
5	CH30 COM	17	CH30 -
4	CH31 +	16	CH31 COM
3	CH31 -	15	CH32 +
2	CH32 COM	14	CH32 -
1	SG	-	-

2-4-2. MFR-16AAOEX (Analog Output)

MFR-16AAOEX is an analog audio output card with D/A converter.
Up to **4** cards can be installed into **Slot No. 09 to 16** and **25 to 32**.

► See section 2-1-1. "Matrix Size Chart."

◆ **MUTE**
Mute can be enabled or disabled for each stereo pair (2 channels).
Mute should be set in the [Web-based Control: **Audio Settings** page].

◆ **Digital-to-Analog Conversion**
32 channels (16 stereo pairs) can be converted and output as analog audio. Audio level and
gain can be set for each stereo pair.
Audio level and gain should be set in the [Web-based Control: **Audio Settings** page].

Level	Sets analog output level for each stereo pair. Audio output level is determined by the digital input level and this setting as shown in the table below. Maximum output level is +24dBm.
Gain	Adjusts analog output level for each channel.

Analog Output Level (determined by the input level and level setting)

Digital audio input level	Analog Output Level Setting			
	-10dBm	0dBm	4dBm	8dBm
-24dBFS	-14dBm	-4dBm	0dBm	+4dBm
-20dBFS	-10dBm	0dBm	+4dBm	+8dBm
-18dBFS	-8dBm	+2dBm	+6dBm	+10dBm
0dBFS	+10dBm	+20dBm	+24dBm	CLIP

◆ Analog Audio Connection

For balanced audio signals, connect the **hot**, **cold** and **shield** conductor to "**+**" ," **-** " and "**COM"** pins respectively.

For unbalanced audio signals, connect the conductor that carries **audio** to a "**+**" pin and **ground** to "**COM.**"

Analog Audio Connector (25-pin D-sub, female, inch screws) x 2

Connector Pin Assignments

Channels 1 to 8

Pin No.	Setting	Pin No.	Setting
13	CH1 +	25	CH1 COM
12	CH1 -	24	CH2 +
11	CH2 COM	23	CH2 -
10	CH3 +	22	CH3 COM
9	CH3 -	21	CH4 +
8	CH4 COM	20	CH4 -
7	CH5 +	19	CH5 COM
6	CH5 -	18	CH6 +
5	CH6 COM	17	CH6 -
4	CH7 +	16	CH7 COM
3	CH7 -	15	CH8 +
2	CH8 COM	14	CH8 -
1	SG	-	-

Channels 9 to 16

Pin No.	Setting	Pin No.	Setting
13	CH9 +	25	CH9 COM
12	CH9 -	24	CH10 +
11	CH10 COM	23	CH10 -
10	CH11 +	22	CH11 COM
9	CH11 -	21	CH12 +
8	CH12 COM	20	CH12 -
7	CH13 +	19	CH13 COM
6	CH13 -	18	CH14 +
5	CH14 COM	17	CH14 -
4	CH15 +	16	CH15 COM
3	CH15 -	15	CH16 +
2	CH16 COM	14	CH16 -
1	SG	-	-

Channels 17 to 24

Pin No.	Setting	Pin No.	Setting
13	CH17 +	25	CH17 COM
12	CH17 -	24	CH18 +
11	CH18 COM	23	CH18 -
10	CH19 +	22	CH19 COM
9	CH19 -	21	CH20 +
8	CH20 COM	20	CH20 -
7	CH21 +	19	CH21 COM
6	CH21 -	18	CH22 +
5	CH22 COM	17	CH22 -
4	CH23 +	16	CH23 COM
3	CH23 -	15	CH24 +
2	CH24 COM	14	CH24 -
1	SG	-	-

Channels 25 to 32

Pin No.	Setting	Pin No.	Setting
13	CH25 +	25	CH25 COM
12	CH25 -	24	CH26 +
11	CH26 COM	23	CH26 -
10	CH27 +	22	CH27 COM
9	CH27 -	21	CH28 +
8	CH28 COM	20	CH28 -
7	CH29 +	19	CH29 COM
6	CH29 -	18	CH30 +
5	CH30 COM	17	CH30 -
4	CH31 +	16	CH31 COM
3	CH31 -	15	CH32 +
2	CH32 COM	14	CH32 -
1	SG	-	-

2-4-3. MFR-16ADI (AES Input with SRC)

MFR-16ADI is an AES/EBU audio input card with SRC.
Up to **4** cards can be installed into **Slot No. 05 to 08**.
► See section 2-1-1. "Matrix Size Chart."
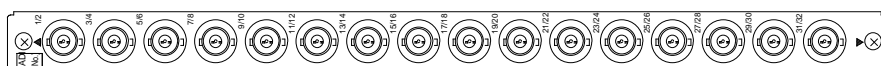
BNC x 16 inputs (16 stereo pairs, 32 channels), unbalanced, 75 Ohm

IMPORTANT
When using an MFR-16ADI, a Black Burst signal should be input to REF IN2. To output the MFR-16ADI digital audio input, use **MFR-16ADAO**.

◆ **SRC (Sample Rate Converter)**
A Sample Rate Converter is implemented in MFR-16ADI cards.
It allows you to accept audio signals of the following frequencies:
    32 kHz, 44.1 kHz, 48 kHz and 96 kHz

If an audio input stereo pair meets the following conditions, set these channels to ON in the [Web-based Control: **Audio Settings** page]. If set to ON, the channels are synchronized to the external reference input and resampled to 48 kHz.

● Audio signals of other frequencies than 48kHz
● Audio signals asynchronous to the external reference input

<table>
<tr><td align="center">IMPORTANT</td></tr>
<tr><td>If setting to OFF for asynchronous or other frequency audio channels, their output will be noisy or choppy.</td></tr>
</table>

2-4-4. MFR-16ADAO (Embedded / AES / Analog Output)

MFR-16ADAO is an audio output card with D/A converter. Each card can output the same audio (up to 8 stereo pairs, 16 channels) from 2 SDI, 8 AES/EBU and analog (4 stereo pairs) output connectors.
Up to **8** cards can be installed into **Slot No. 09 to 16**.
► See section 2-1-1. "Matrix Size Chart."

No.	Name	Description
1	SDI OUT1 SDI OUT2	Outputs SDI audio embedded SDI signals (8 stereo pairs, 16 channels), BNC x 2 * Supported video formats: 1080/59.94i and 1080/60i The following shows which audio signals are embedded in which channels on SDI OUT1/2. 1/2: AES 15/16 3/4: AES 13/14 5/6: AES 11/12 7/8: AES 9/10 9/10: AES 7/8 11/12: AES 5/6 13/14: AES 3/4 15/16: AES 1/2
2	DIGITAL AUDIO OUT 1/2 to 15/16	Outputs AES/EBU signals (8 stereo pairs, 16 channels), unbalanced, 75-ohm, BNC x 8 * Output audio is synchronized with the REF IN2 input.
3	ANALOG AUDIO OUT 1 to 8	Outputs analog audio signals (4 stereo pairs, 8 channels) balanced or unbalanced, 25-pin D-Sub x 1 (female),

<table>
<tr><td align="center">IMPORTANT</td></tr>
<tr><td>When MFR-16ADAO cards are installed, Black Burst signal should be input to REF IN2 on the MFR-8000. MFR-16ADAO cards can output audio signals input to **MFR-16ADI** or **MFR-16AAI/AAIEX**.</td></tr>
</table>

◆ **V-Fade**
The V-Fade function can erase switching noise by setting fade-in and fade-out duration time.
V-Fade should be set in the [Web-based Control: **Audio Settings** page].

Fade-in   Fade-out

Crosspoint switching →   Crosspoint switching →
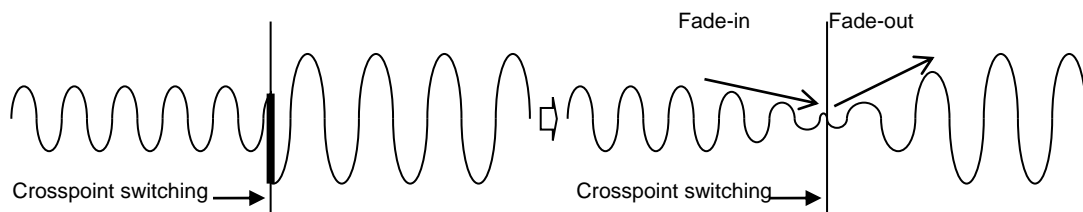
◆ Audio De-embedding from SDI

In addition to audio channels input to MFR-16ADI, embedded audio channels input to MFR-16SDIA can output from MFR-16ADAO by de-embedding audio from SDI signals.
SDI-embedded audio should be set in the [Web-based Control: **Audio Settings** page].

Note that embedded audio should meet the following requirements. Otherwise, audio output should be choppy or noisy.
- Audio channels at 48kHz sample rates.
- Audio channels synchronized to the external reference signal (REF IN2 input).

◆ MUTE

Mute can be enabled or disabled for each stereo pair (2 channels).
Mute should be set in the [Web-based Control: **Audio Settings** page].

◆ Digital-to-Analog Conversion

8 channels (4 stereo pairs) can be converted and output as analog audio. Audio level and gain can be set for each stereo pair.
Audio level and gain should be set in the [Web-based Control: **Audio Settings** page].

Select AES	Selects 4 stereo pairs (8 channels) output as analog audio from the AES/EBU output channels.
Level	Sets analog signal output level for each channel. Audio output level is determined by the digital input level and this setting as shown in the table below. Maximum output level is +24dBm.
Gain	Adjusts analog output level for each channel.

Analog Output Level (determined by the input level and level setting)

Digital audio input level	Analog Output Level Setting			
	-10dBm	0dBm	4dBm	8dBm
-24dBFS	-14dBm	-4dBm	0dBm	+4dBm
-20dBFS	-10dBm	0dBm	+4dBm	+8dBm
-18dBFS	-8dBm	+2dBm	+6dBm	+10dBm
0dBFS	+10dBm	+20dBm	+24dBm	CLIP

◆ Analog Audio Connection

For balanced audio signals, connect the **hot**, **cold** and **shield** conductor to "**+**" ," **-** " and "**COM"** pins respectively.
For unbalanced audio signals, connect the conductor that carries **audio** to a "**+**" pin and **ground** to "**COM.**"

Analog Audio Connector (25-pin D-sub, female, inch screws)

Pin Assignments

Pin No.	Setting	Pin No.	Setting
13	CH1 +	25	CH1 COM
12	CH1 -	24	CH2 +
11	CH2 COM	23	CH2 -
10	CH3 +	22	CH3 COM
9	CH3 -	21	CH4 +
8	CH4 COM	20	CH4 -
7	CH5 +	19	CH5 COM
6	CH5 -	18	CH6 +
5	CH6 COM	17	CH6 -
4	CH7 +	16	CH7 COM
3	CH7 -	15	CH8 +
2	CH8 COM	14	CH8 -
1	SG	-	-

2-4-5. MFR-16AESI (AES Input)

MFR-16AESI is a digital audio input card.
Up to **16** cards can be installed into **Slot No. 01 to 08** and **17 to 24**.
► See section 2-1-1. "Matrix Size Chart."
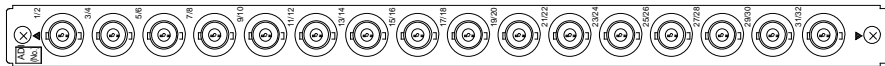
BNC x 16 inputs (16 stereo pairs, 32 channels), unbalanced, 75 Ohm

IMPORTANT
To output MFR-16AESI input audio, **MFR-16AESO/16AAOEX** is required.

2-4-6. MFR-16AESO (AES Output)

MFR-16AESO is a digital audio output card.
Up to **16** cards can be installed into **Slot No. 09 to 16** and **25 to 32**.
► See section 2-1-1. "Matrix Size Chart."
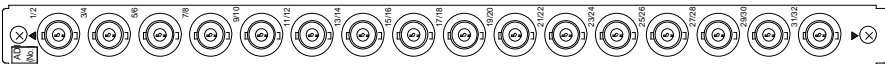
BNC x 16 outputs (16 stereo pairs, 32 channels), unbalanced, 75 Ohm

IMPORTANT
MFR-16AESO cards can output audio signals input to **MFR-16AESI/16AAIEX**.

2-5. RS-422 Data Input / Output Cards

MFR-16ADI is an RS-422 serial control input/output card compliant with the SMPTE 207M standard. .
Up to **8** cards can be installed into the following slots:
No. 02, 04, 06, 08, 10, 12, 14, 16, 17, 19, 21, 23, 25, 27, 29, 31.

► See section 2-1-1. "Matrix Size Chart."

◆ MFR-16DTIO Card
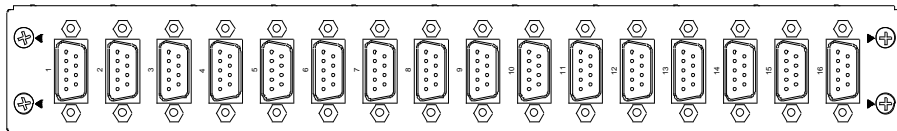
RS-422 Connector: 9-pin D-sub (female) x 16
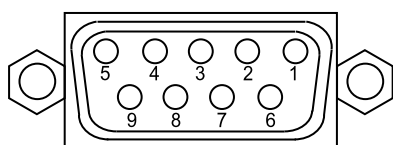
◆ Connector Pin Assignments (9-pin D-sub, female)

Pin no.	Device type *		Controller type *	
1	GND		GND	
2	TX--	Transmit data(-)	RX-	Receive data(-)
3	RX+	Receive data(+)	TX+	Transmit data(+)
4	GND		GND	
5	NC		NC	
6	GND		GND	
7	TX+	Transmit data(+)	RX+	Receive data(+)
8	RX-	Receive data(-)	TX-	Transmit data(-)
9	GND		GND	

* Two pin assignment types are available: **Device** and **Controller**. The type can be selected under **Pin Assign** in the [Web-based Control: **RS-422 Settings** page].

► See the [Web-based Control: **RS-422 Settings** page] in the Web-based Control manual.

◆ Port Assignments

<Setting per Card>
● Specify a logical level under **Level**.

<Settings per Port>
● Assign a logical channel to a port under **Channel**.
● Assign Input (**SRC**) or Output (**DST**) for a port.
  Both Input and Output can be assigned to a single port. This can dynamically change Input / Output and pin assignments. (**2-Way** must be checked on.)
● Select a pin assignments type under **Pin Assign**. (See the table above.)

The port assignments can be performed in the **Port Assign** area in the [Web-based Control: **RS-422 Settings** page].

◆ **RS-422 Transmission Settings**
The **Route** and **Switching Mode** settings allow you to minimize I/O delay or to prevent data loss or corruption during switches.
They can be set in the [Web-based Control: **RS-422 Settings** page].

To transmit data with minimum delay:
>> Select **Direct** under **Route**.

To guarantee transmission reliability:
>> Set **Switching Mode** to **ON** and specify **Data Rate**, **Parity** and **Stop Bit**.

The table below shows details on how data switches are performed within the same card or between cards depending on the Route and Switching Mode settings.

		Route Setting			
		Direct		Via Main MTX	
		Within a card	Between cards	Within a card	Between cards
Switching Mode Setting	ON			I/O delay: Large Asynchronous Data loss: No	I/O delay: Large Asynchronous Data loss: No
	OFF	I/O delay: Small Asynchronous Data loss: Yes	I/O delay: Large Asynchronous Data loss: Yes	I/O delay: Large Synchronous Data loss: Yes	I/O delay: Large Synchronous Data loss: Yes

I/O delay: The minimum delay is approx.190 nsec (Small) when an input and output ports are on the same card. In other cases, the delay becomes larger, from 0.8 msec (Large).

Synchronous / Asynchronous: This indicates whether data switches are always synchronizes with audio and video switches. "Asynchronous" means data switches may be delayed by one field (or one frame) relative to video or audio switches.

Data loss: This indicates whether data loss can occur during switches.

2-6. MFR-GPI

2-6-1. Front Panel
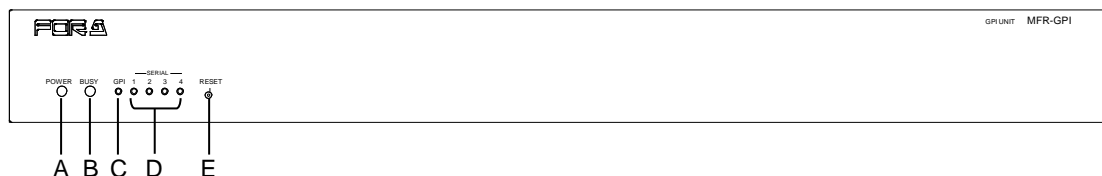
No.	Item	Description
A	POWER	Displays the power status. ► See the table below for details on indications.
B	BUSY	Displays the flash memory writing status of backup settings. ► See the table below for details on indications.
C	GPI	When the GPI function is assigned using the Web-based Control, the LED lights green. The LED remains unlit when there is no assignment.
D	SERIAL 1-4	When a serial port is assigned using the Web-based Control, the LED lights green. The LED remains unlit when there is no assignment.
E	RESET	Used to re-initialize the GPI unit.

◆ **Color indications on the MFR-GUI front panel**

LED \ LED Color	Green	Red	Orange
POWER	Normal	Power alarm	
BUSY	Normal processing		Writing to flash memory

* POWER LED lights red if the unit is turned on but is unconnected to a network.

IMPORTANT
After finishing settings, do **not power OFF** the unit while BUSY LED is **lit orange**, since the system is writing to Flash. (It takes about two minutes at max.)

2-6-2. Rear Panel
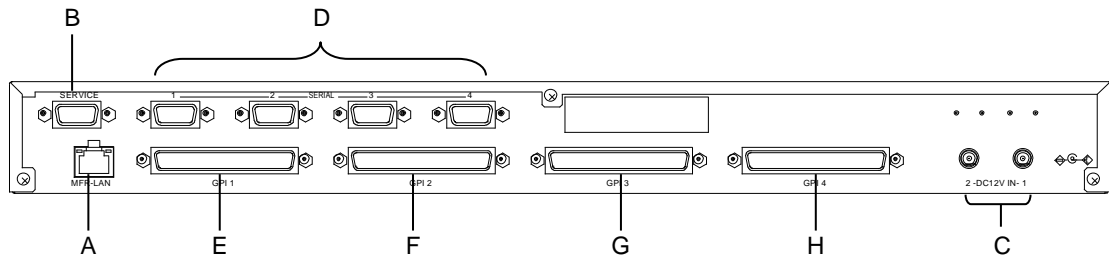
No.	Item	Description
A	MFR-LAN *1	Used to connect the MFR main unit Ethernet port (10/100BASE-TX)
B	SERVICE	Used for maintenance only. Do not use.
C	DC 12 V IN 1 and 2	Used to supply 12 V DC power.
D	SERIAL1 to 4	Used for serial interface control. The default setting is RS-422. RS-232C is also selectable using switches on the internal card. ► See section 2-6-4. "Switches on the Card." Pin assignments are the same as those on the MFR main unit. ► See section 2-2-1. "Interfaces."
E	GPI 1 (Port no: 1)	Used for GPI input / output connections. (32 total assignable inputs and outputs)
F	GPI 2 (Port no: 2)	Used for GPI input / output connections. (32 total assignable inputs and outputs)
G	GPI 3 (Port no: 3)	Used for GPI input / output connections. (32 total assignable inputs and outputs)
H	GPI 4 (Port no: 4)	Used for GPI input / output connections. (32 total assignable inputs and outputs)

*1 The MFR-LAN connector may be labeled 10/100BASE-T on the previous model.

2-6-3. Interfaces (MFR-GPI)

◆ **GPI IN / TALLY OUT Connector (37-pin D-sub, female)**
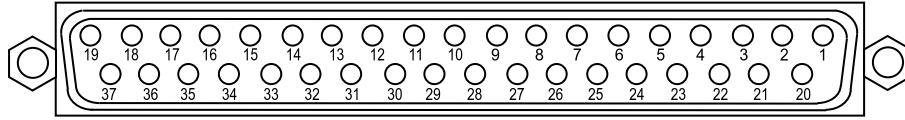
Pin No.	Signal	Pin No.	Signal
1	GPI_IN / TALLY_OUT 01 #	20	GPI_IN / TALLY_OUT 20 #
2	GPI_IN / TALLY_OUT 02 #	21	GPI_IN / TALLY_OUT 21 #
3	GPI_IN / TALLY_OUT 03 #	22	GPI_IN / TALLY_OUT 22 #
4	GPI_IN / TALLY_OUT 04 #	23	GPI_IN / TALLY_OUT 23 #
5	GPI_IN / TALLY_OUT 05 #	24	GPI_IN / TALLY_OUT 24 #
6	GPI_IN / TALLY_OUT 06 #	25	GPI_IN / TALLY_OUT 25 #
7	GPI_IN / TALLY_OUT 07 #	26	GPI_IN / TALLY_OUT 26 #
8	GPI_IN / TALLY_OUT 08 #	27	GPI_IN / TALLY_OUT 27 #
9	GPI_IN / TALLY_OUT 09 #	28	GPI_IN / TALLY_OUT 28 #
10	GPI_IN / TALLY_OUT 10 #	29	GPI_IN / TALLY_OUT 29 #
11	GPI_IN / TALLY_OUT 11 #	30	GPI_IN / TALLY_OUT 30 #
12	GPI_IN / TALLY_OUT 12 #	31	GPI_IN / TALLY_OUT 31 #
13	GPI_IN / TALLY_OUT 13 #	32	GPI_IN / TALLY_OUT 32 #
14	GPI_IN / TALLY_OUT 14 #	33	Frame ground
15	GPI_IN / TALLY_OUT 15 #	34	Frame ground
16	GPI_IN / TALLY_OUT 16 #	35	Frame ground
17	GPI_IN / TALLY_OUT 17 #	36	+4.8V output
18	GPI_IN / TALLY_OUT 18 #	37	+4.8V output
19	GPI_IN / TALLY_OUT 19 #		

*   The symbol "#" at the end of signals represents the port number (1, 2, 3 or 4).
*   The maximum total output current for all +4.8 V outputs is 1.5 A.
*   The GPI input pulse width should be 54 ms or more.

◆ **GPI IN Circuits**
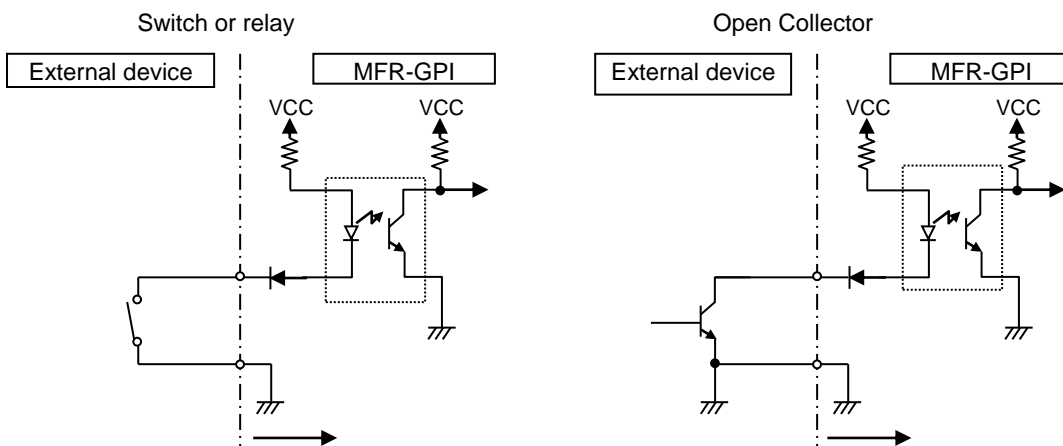
◆ GPI OUT / TALLY OUT Circuit

MFR-GPI		External device

Max. voltage: 40V

Max. current: 100mA

10Ω
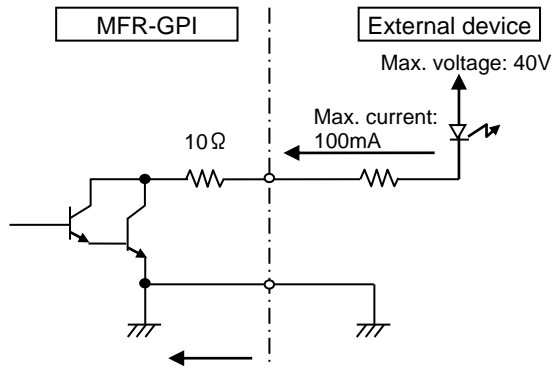
* The voltage is about 0.9 V when turned-on.
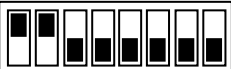
2-6-4. Switches on the Card

CAUTION
Do not access internal cards or make connections with the unit powered ON. Always power OFF all connected units / disconnect power cords prior to accessing the interior.
Further note that adjustments and maintenance should only be performed by qualified technical personnel familiar with FOR-A equipment.

Remove the two screws on both sides of the MFR-GPI to access the internal card as shown below. The figure below shows the factory default switch settings.
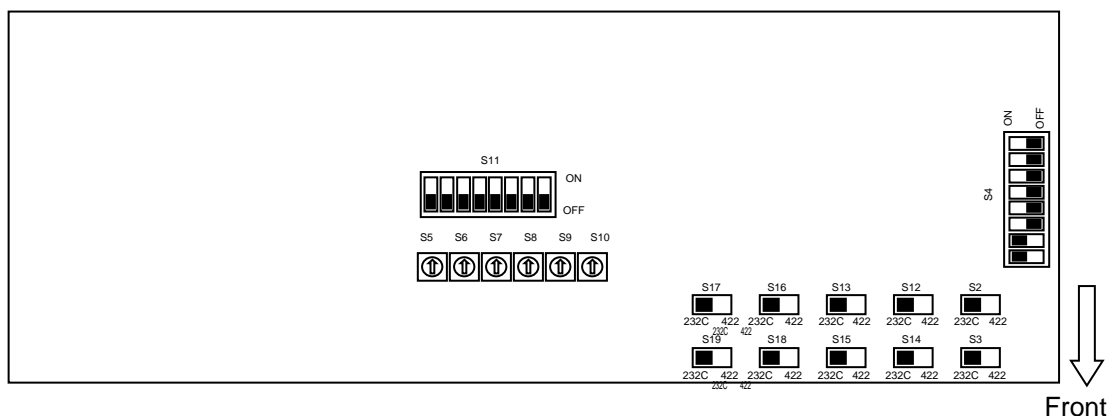
Switch	Function / Settings			
S2, S3	Used for maintenance. Do not use.			
S4	Used for maintenance. Do not use. (The factory default setting is as shown at right. The black boxes (■) represent switches.)		ON OFF	
S5, S6, S7, S8, S9, S10	Used for IP address setting.			
S11	Used for maintenance. Do not use.		ON OFF	
S12, S14	Used to select RS-232C/RS-422 for SERIAL 1. The default setting is RS-422 (both switches to the right). To change to RS-232C, set both switches to the left.	Switch Settings	RS-232C (Factory default setting)	
S13, S15	Used to select RS-232C/RS-422 for SERIAL 2. The default setting is RS-422 (both switches to the right). To change to RS-232C, set both switches to the left.			
S16, S18	Used to select RS-232C/RS-422 for SERIAL 3. The default setting is RS-422 (both switches to the right). To change to RS-232C, set both switches to the left.		RS-422	
S17, S19	Used to select RS-232C/RS-422 for SERIAL 4. The default setting is RS-422 (both switches to the right). To change to RS-232C, set both switches to the left.			

2-7. MFR-TALM

2-7-1. Front Panel
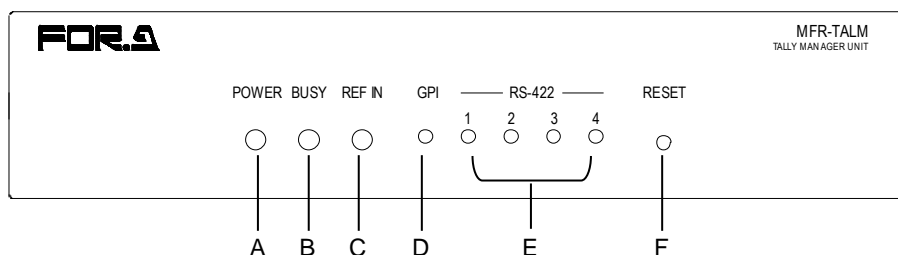
No.	Item	Description
A	POWER	Displays the power status. ► See the table below for details on indications.
B	BUSY	Displays the flash memory writing status of backup settings. ► See the table below for details on indications.
C	REF IN	Lights green when an external reference signal is present.
D	GPI	Lights green a GPI function is assigned. Turns off when no GPI function is assigned.
E	RS-422 1-4	Lights green when a port function is assigned. Turns off when no port function is assigned.
F	RESET	Resets MFR-TALM.

◆ **Color indications on the MFR-TALM front panel**

LED \ LED Color	Green	Red	Orange
POWER	Normal	Power alarm	
BUSY	Normal processing		Writing to flash memory

IMPORTANT
Do not power off the unit while BUSY LED is lit orange (writing to the flash memory, about 2 seconds at most).

2-7-2. Rear Panel
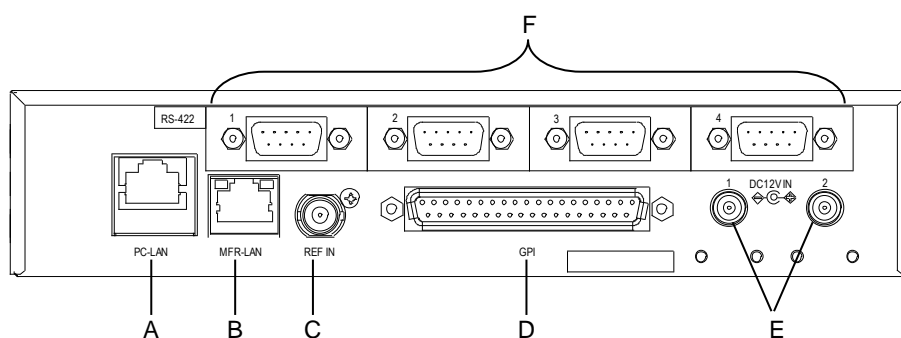
No.	Item	Description
A	PC-LAN	Ethernet port for connection to PC or other external unit (10/100BASE-TX, RJ-45)
B	MFR-LAN	Ethernet port for connection to MFR main unit (10/100/1000BASE-T, RJ-45)
C	REF IN	Used to input a reference signal (BB or Tri-level sync signal) (with loop-through. Terminate with 75Ω terminator, if unused.)
D	GPI	Used to input/output GPI signals for external control. (32 total assignable inputs and outputs) Pin assignments are the same as those of the MFR-GPI connectors. ► See section 2-6-3. "Interfaces (MFR-GPI)."
E	DC 12 V IN 1,2	Used to supply 12 V DC power.
F	RS-422 1-4	Used for RS-422 interface control. Pin assignments are the same as those of the MFR main unit. ► See section 2-2-1. "Interfaces."

3. System Configuration Example

3-1. Basic Configuration

The block diagram below shows an example of the basic MFR routing system that consists of an MFR-8000, Remote Unit and the Web-based Control accessed from a computer.
Make sure to connect both MFR-LANs (CPU1) and (CPU2) to a LAN respectively for CPU redundancy. Their LAN connections must be separated from the network segment of PC-LAN and other devices. (Default IP addresses (Net mask: 255.255.255.0) are used in the configuration example below.)
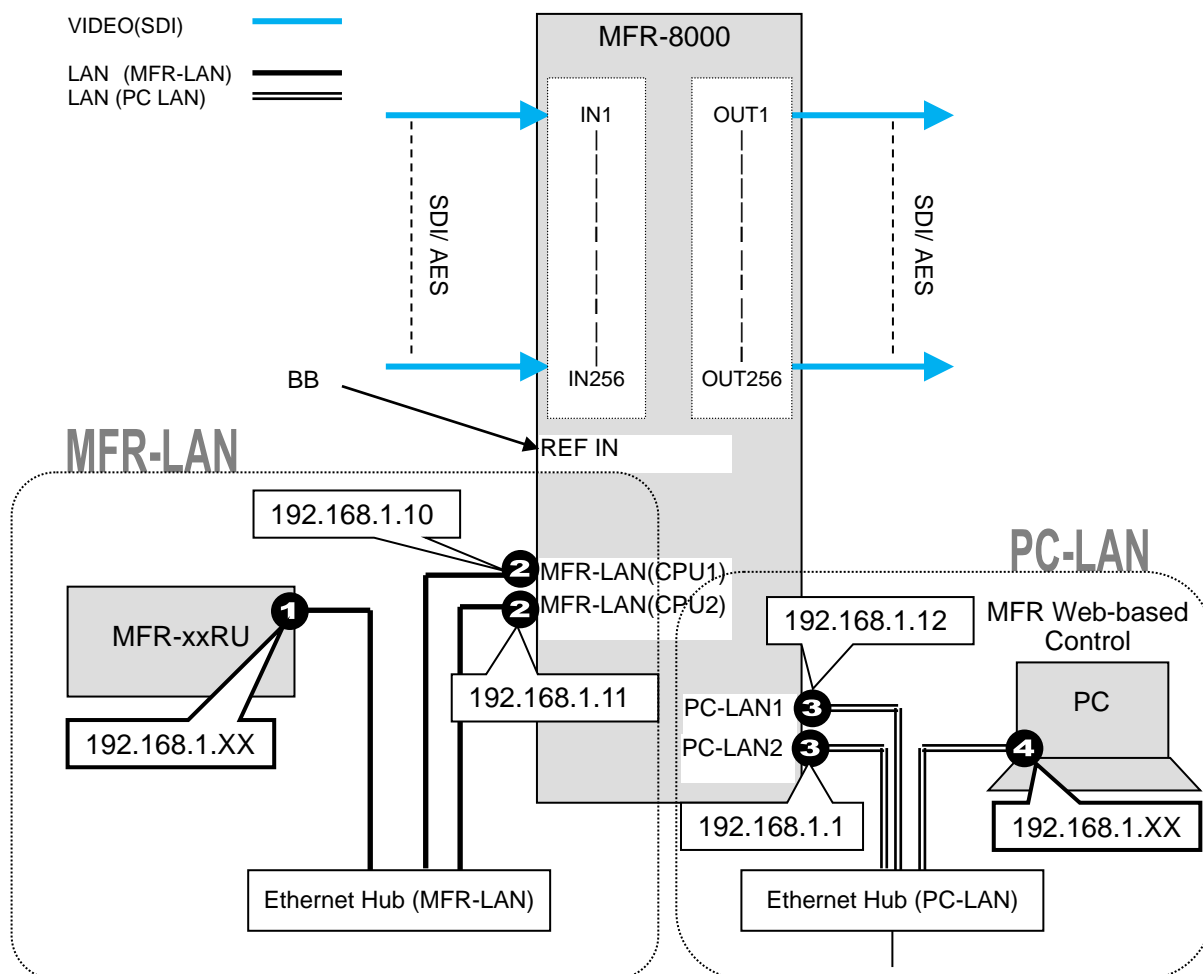
◆ **LAN Port Settings**

Port	RU Front Panel (Sec. in MFR-RU Series Operation Manual)	Web-based Control
❶	MFR-39RUA: See sec.3-4-4. MFR-39RU: See sec. 3-6-1. MFR-18RU/18RUA: See sec. 3-8-1 and 3-8-2. Other RUs: See sec. 3-10-1 and 3-10-2.	RU Settings page
❷	---	MU Settings page
❸	MFR-39RUA: See sec. 3-4-4 (display only). MFR-39RU: See sec. 3-6-3 (display only). MFR-18RU/18RUA: See sec. 3-8-1 (display only). Other RUs: See sec. 3-10-1 (display only).	Network Settings page

3-2. Main Unit Linking

A parallel link system can be configured, in which multiple MFR-8000 can be controlled simultaneously.

IP port and SNMP settings should be performed on **each** MFR-8000 unit. After these settings are completed, all linked MFR-8000 units are set and **controlled** together on the unit that is specified as **Master**.

<table>
<tr><td align="center">Main Unit Link Specifications</td></tr>
<tr><td>

● Main Unit Link systems are set and controlled through a specified **master** unit. Up to **2** MFR-8000 units can be linked within a system.

● Parallel links using each one of MFR-5000 and one MFR-8000 are possible. **MFR-8000** and other MFR main units (**MFR-3000/ 3232/ 3216/ 1616/ 1616R/ 1616A/ 3216RPS/ 3232RPS**) can**not** be linked to each other.

● All MFR main units in a link system must be linked together and independent units cannot exist in the system.

</td></tr>
</table>

3-2-1. Parallel Link System Example

The system example below is a redundant system using two MFR-8000 units.
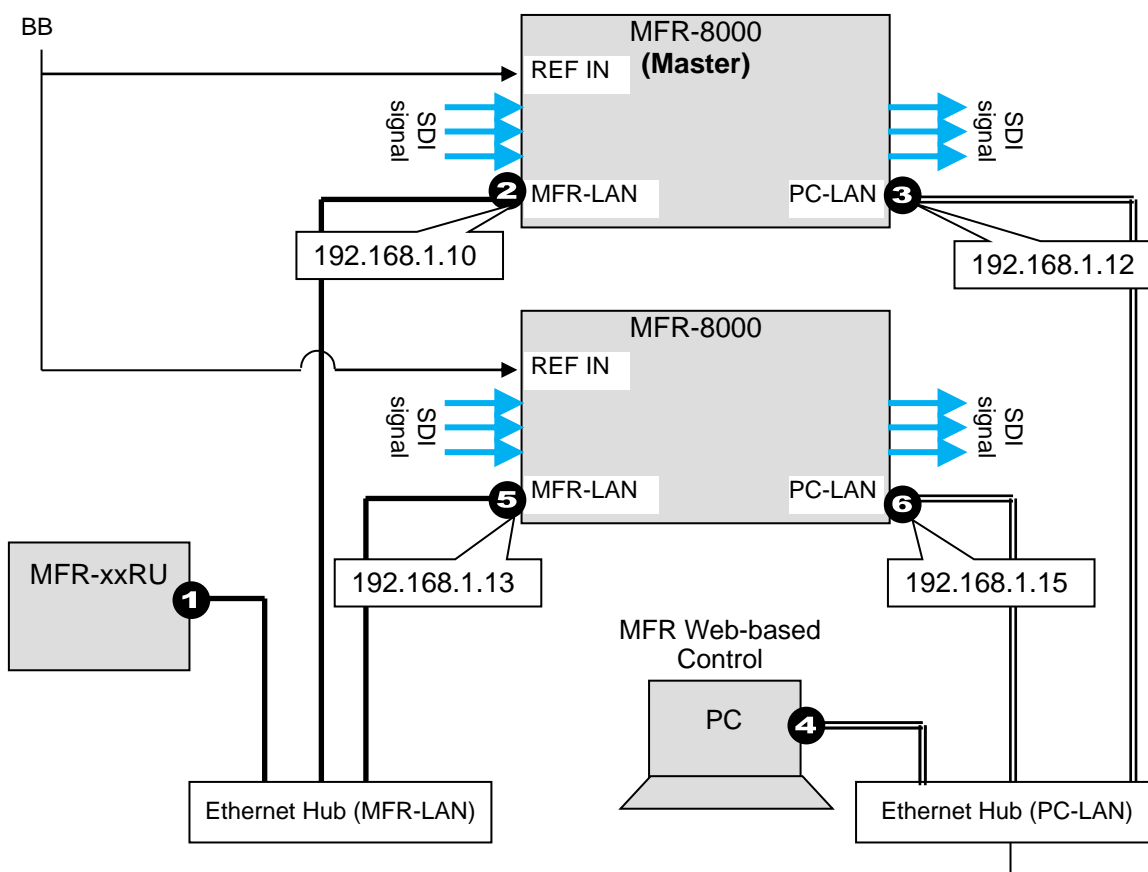
Note that in all MFR-8000 units the IP address of MFR-LAN1 is set to 192.168.1.10 and that of PC-LAN to 192.168.1.12 as factory default. To prevent IP address overlap in a system, you need to change IP addresses of either unit.

Also note that desired IP addresses can be set for system devices according to your network conditions.

◆ **Setup Procedure**
1) Connect all devices in the MFR system as shown in the figure in the previous page. Power on the MFR-8000 to be set as a Master, Remote Control unit and PC. Set the IP addresses for the Remote Control unit (①) and PC (④). Power off the MFR-8000.
2) Power on another MFR-8000. Set the IP addresses (⑤ and ⑥) as shown in the previous page.
3) Power on the Master MFR-8000.
4) Connect to the Master MFR-8000 Web-based control and open the **Build Settings** page. Check on **Build Enable** to enable the Main Unit Link feature.
▶ See section 12 "Main Unit Link" in the "Web-based Control Operation Manual."

3-3. Signal Name and Tally Link System

3-3-1. Standard Configuration

The block diagram below shows a basic signal name and tally link system.

To connect a video switcher via serial connection, use the MFR-8000 SERIAL port or SERIAL1-4 on MFR-GPI. The signal name and tally link system requires an RS-422 interface. Before connecting devices, set the serial port for use to RS-422 using the switches on the Card.

► See section 2-1-4. CPU Card Switch Settings or 2-6-4. "Switches on the Card."

VIDEO(SDI)

LAN (MFR-LAN)
LAN (PC LAN)
RS-422

MFR-8000

| MFR-16SDIA | MFR-16SDO |

IN1 OUT1

SDI signal

IN256 OUT256

REF IN SERIAL

MFR-LAN(CPU1)
MFR-LAN(CPU2)

PC-LAN

MFR-GPI

SERIAL 1

MFR-16RU

MFR-16RUD

MFR-40RU

MFR-18RU

MFR-39RU

Ethernet Hub (MFR-LAN)

Video Switcher
(HVS-2000)

SDI

RS-422

SDI signal

SDI

Multi Viewer
(MV-4200)

SERIAL

LAN

Ethernet Hub (PC-LAN)

PGM Monitor

PRV Monitor

DVI MV Monitor

DVI MV Monitor

DVI MV Monitor

DVI MV Monitor

MFR Web Control
MV Layout Editor

PC

◆ Transmitting Signal Name and Tally Data

The figure below shows the routing of signal name and tally data.

> Set each serial port following the table on this page using the MFR Web Control and on the switcher.
>
> Each tally information setting should be performed in the [Web-based Control: **Tally System Settings** page].
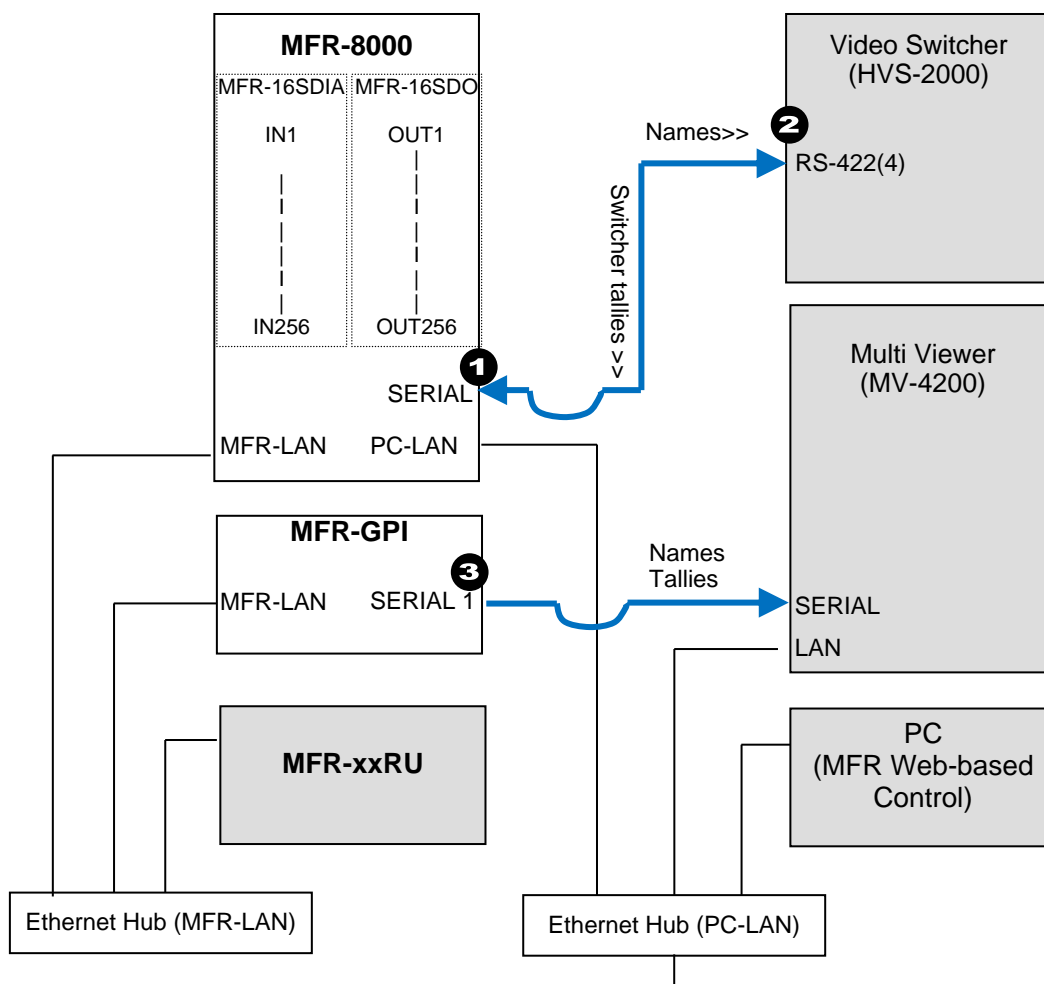
Serial Port Settings

Port	Menu	[Port Settings] - [Serial Port]			
		Connector	Function	Baud rate	Parity
❶	Web-based Control [Router System Settings]	(MU) -	Router/HVS connection type 2	38400	NONE
❷	HVS-2000 [SETUP - SYSTEM - RS-422]		ROUTER	38400	NONE
❸	Web-based Control [Router System Settings]	(GPI) No. 1	Tally out (TSL Ver. 3.1)	38400	EVEN

Other Parameter Settings (in HVS-2000)

To receive source names from the router, set [LINK] in the ROUTER NAME menu to [MFR].

3-3-2. If Configuring an MFR-TALM

The block diagram below shows an example signal name and tally link system comprised of a FOR-A video switcher and multiviewer using an MFR-TALM unit. The MFR-TALM is specifically designed to perform the task of tally data computation, which is ordinarily undertaken by the MFR main unit, to accelerate the computation. RS-422 ports (1) to (4) are available for video switcher connection.

> Before using an MFR-TALM unit for the system, change **Tally Control Unit** to **MFR-TALM** in the [**Main unit** Web-based Control: **MU Settings** page].

VIDEO(SDI)

LAN (MFR-LAN)
LAN (PC LAN)
RS-422
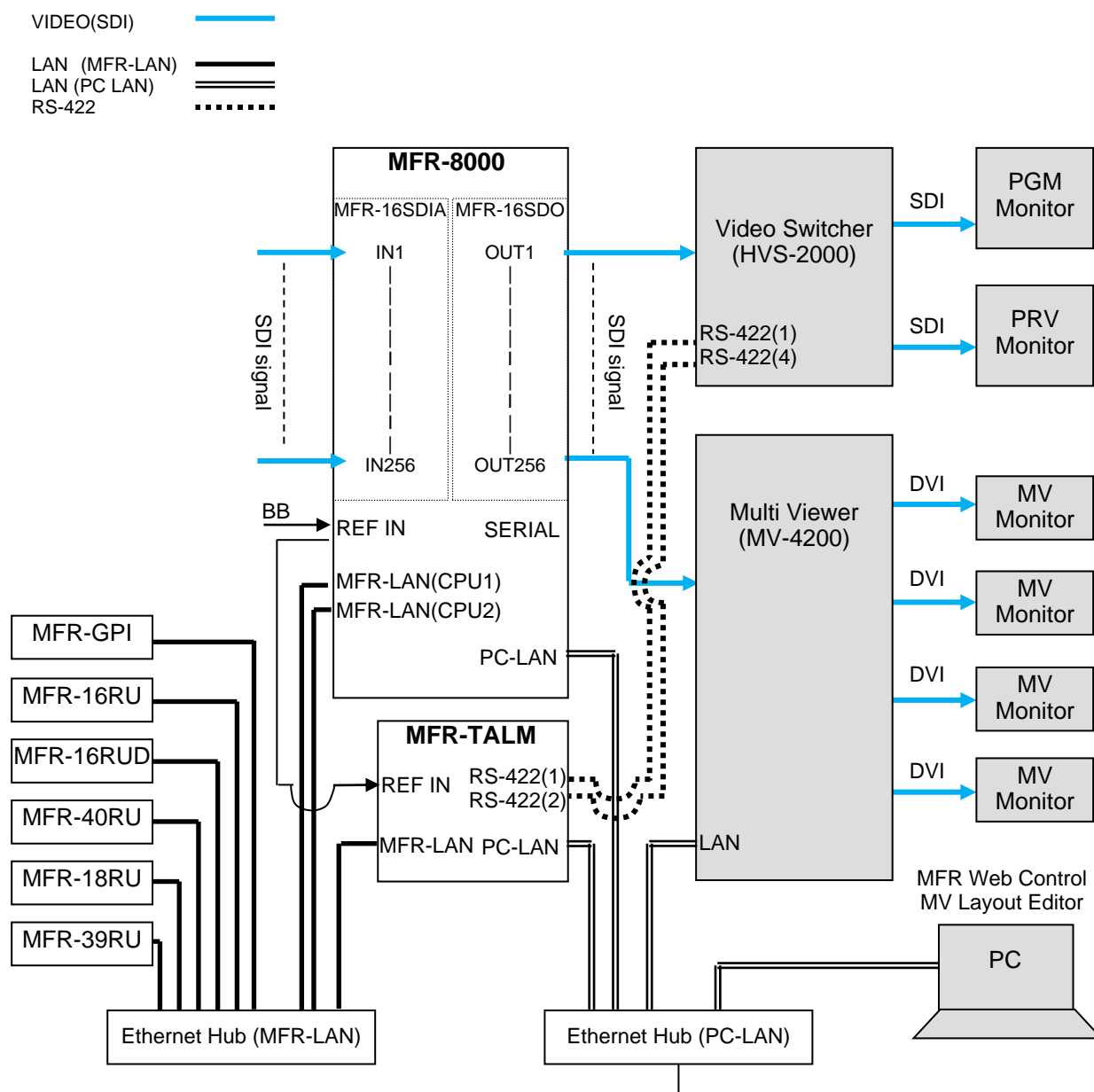
◆ **Transmitting Signal Name and Tally Data**

The figure below shows an example signal name and tally data routing system using the MFR-TALM.
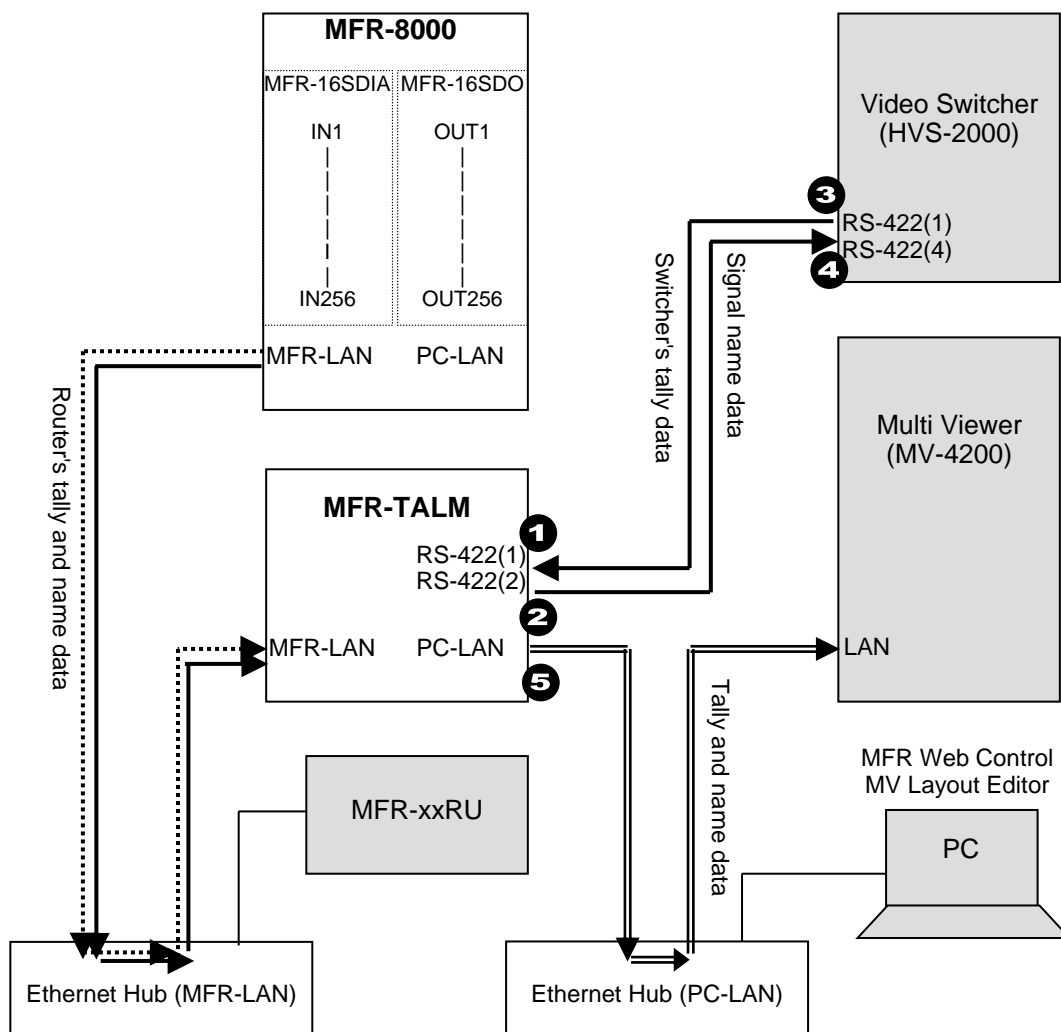
Each serial port should be set as shown in the table below in the relevant page of the **MFR-TALM** Web-based Control accessed from "**http://192.168.1.62**" (default IP address) on your web browser.

Serial Port Settings

Open the [MFR-TALM Web-based Control: **Port Settings** page] and perform port settings under **Serial Port**.

As for the HVS-2000 unit, perform port setting in the [SETUP - SYSTEM - RS-422] menu.

Port	Menu	[Port Settings] - [Serial Port]			
		Connector	Function	Baud rate	Parity
❶	Web-based Control [TALM Settings]	No. 1	HVS-TAL Protocol Reception	38400	EVEN
❷	Web-based Control [TALM Settings]	No. 2	Router/HVS connection type 2	38400	NONE
❸	HVS-2000 [SETUP - SYSTEM - RS-422]	No. 1	TALLY	38400	EVEN
❹	HVS-2000 [SETUP - SYSTEM - RS-422]	No. 4	ROUTER	38400	NONE

TCP/IP Setting

Open the [MFR-TALM Web-based Control: **Port Settings** page] and perform port settings under **TCP/IP Port**.

Port	Menu	[Port Settings] - [TCP/IP Port]			
		Access Method	IP Address	Port	Function
❺	Web-based Control [TALM Settings]	Client	(MV IP address)	(MV TCP/IP port number)	TSL UMD protocol V5.0 Tally out

Encode	DLE	Screen No.
Unicode	ON	(Set the same as in MV)

Data transmission settings between HVS-2000 and MFR-TALM
<HVS-2000-side>
● To receive name data from the router, set **LINK** in the ROUTER NAME menu to **MFR.**
● Perform the TALLY COLOR and TALLY UNIT 1, 3 and 5 settings so that the MFR-TALM unit can receive switcher tally data.

<MFR-TALM-side>
● Open the [MFR-TALM Web-based Control: **HVS-TAL Protocol Reception** page] and perform the same tally settings as those in HVS-2000.

The tally settings in the MFR system must be entered in the [MFR-TALM Web-based Control: **Tally System Settings** page]. When using MFR-TALM for tally control, the [Main unit Web-based Control: **Tally System Settings** page] and its subpages are all disabled.

Refer to your multiviewer's user guide for the details on how to handle tally data on the multiviewer.

3-4. Switcher's AUX Crosspoints Switching System

This system enables the following two features:

- Switches AUX crosspoints on a switcher using an MFR Series Remote Unit or serial commands.
- Switches AUX crosspoints on a switcher as well as the corresponding crosspoints on the MFR-8000, if the MFR-8000 provides video souces to the switcher.

Supported switcher: **HVS-390HS, HVS-100/110, HVS-2000**

◆ Connection Example
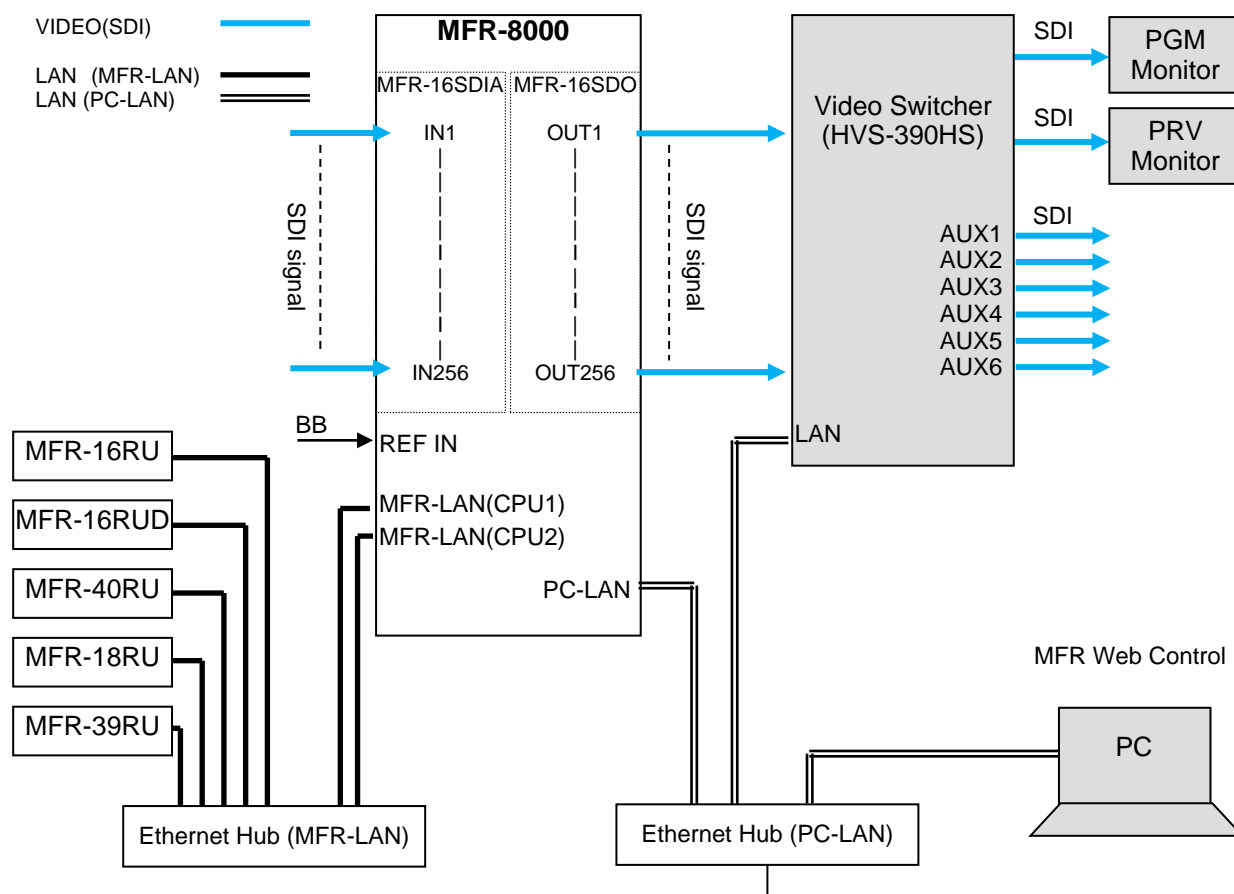
3-4-1. Switching an AUX Bus Signal

Assume that the system is configured as shown below:
AUX1 on the switcher is assigned to **DST 129** (Level 1) on the MFR-8000.
IN1-8 and **STL** (Still) **3** on the switcher are assigned to **SRC129-137** on the MFR-8000.
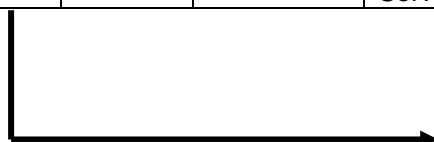
49
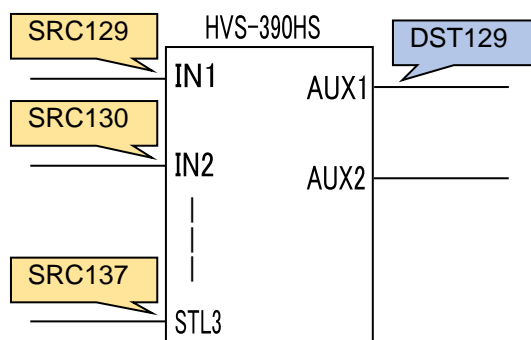
◆ **Setup Settings**
1) Connect and assign video signals as shown in the figure above.
2) Device Setup on the MFR-8000:
   Connect to the MFR-8000 from the Web-based Control PC and open the [**Tally System Settings - Device Select**] page. Select **HVS-390HS** in the [**Switcher**] field and click [**Send**].
3) Network settings on the MFR-8000:
   Open the [**Router System Settings - PortSettings**] page and set the TCP/IP menu as shown below.

IP Address	Port	Protocol	Function	Local Port(MFR)
(Switcher's IP address)	※	UDP	Editor(HVS)	Select a UDP port number. Do not use the UDP port number (Default: 23) already used in the Server (MFR).

Switcher	Port
HVS-390HS	8740
HVS-100/110	8740
HVS-2000	53381

4) Assign AUX buses and input channels on the switcher to logical destination and sources channels on the MFR-8000.

   <AUX bus assignments>
   a) Open the **Destination Assignment** page.
   b) Select **HVS (AUX)** under **Select Table**.
   c) Set **Level** to **1**.
   d) Assign **AUX1** to **DST 129**.

   <Input channel assignments>
   a) Open the **Source Assignment** page.
   b) Select **HVS (AUX)** under **Select Table**.
   c) Set **Level** to **1**.
   d) Assign input channels to MFR sources as shown below.

LogicalNo./Name		Switcher Channel
129	SRC 129	IN1
136	SRC 136	IN8
137	SRC 137	STL3

5) Settings on the switcher:
   Open the [SETUP - EXT I/F - EDITOR] menu on the HVS-390HS.
   Change [TYPE] to [**DVS**] and [ENABLE] to [**ON**].

After above setup settings are complete:
● If **SRC 129** is selected for **DST 129**,
   AUX1 outputs **IN1** video on the switcher.

● If **SRC 137** is selected for **DST 129**,
   AUX1 outputs **Still 3** video on the switcher.

● If **IN4** is selected for **AUX1** on the switcher,
   SRC 132 is selected for **DST 129** on the MFR-8000.

> If input channels that are not assigned in the **Source Assignment** page are selected on the switcher, they are replaced with the Alternative Source set in the **Source Assignment** page in the MFR system.

3-4-2. Synchronous Crosspoints Switching

Configure the system as described 1) to 3) in Sec. 3-4-1.

4) Configure channel link settings:
   Open the **Re-Entry** page and set the menu page as shown below.

Output	Input
MFR Dst 112	HVS-390HS IN9 > AUX 1
MFR Dst 113	HVS-390HS IN10 > AUX 2

   *   Physical destination channels must be assigned to these logical destination channels on the MFR-8000.
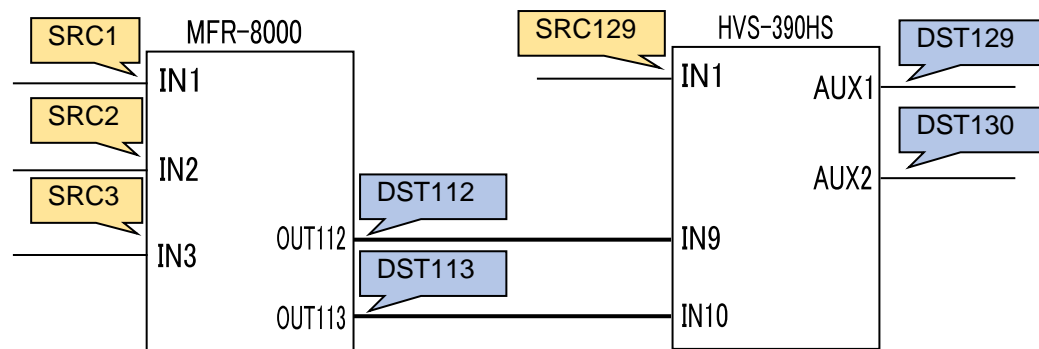
5) Assign logical source and destination channels on the MFR-8000 to input channels and AUX buses on the switcher.
   <AUX bus assignments>
   a) Open the **Destination Assignment** page.
   b) Select **HVS (AUX)** under **Select Table**.
   c) Set **Level** to **1**.
   d) Assign **AUX1** to **DST 129**.
   e) Assign **AUX2** to **DST 130**.

   <Input channel assignments>
   a) Open the **Source Assignment** page.
   b) Select **HVS (AUX)** under **Select Table**.
   c) Set **Level** to **1**.
   d) Assign **IN1** to **SRC 129**.

After above setup settings are complete:
● If **SRC 129** is selected for **DST 129** on the MFR-8000,
   IN1 is selected for **AUX1** on the switcher.

● If **SRC 3** is selected for **DST 129** on the MFR-8000,
   IN9 is selected for **AUX1** on the switcher and **SRC 3** is also selected for **DST 112** on the MFR-8000.

● If **IN9** is selected for **AUX1** on the switcher,
   a source assigned to DST 112 is selected for **DST 129** on the MFR-8000.

● If **IN10** is selected for **AUX2** on the switcher,
   a source assigned to DST 113 is selected for **DST 130** on the MFR-8000

IMPORTANT
-Note that destination channels to which physical channels are assigned (DST 112 and DST 113 in the example above) on the MFR-8000 cannot select source channels to which the switcher input channels are assigned (SRC 129 in the example above).
-If an AUX crosspoint is switched on the switcher by the Synchronous Crosspoints switching and it is not listed in Re-Entry page, the AUX crosspoint returns to the previous state.

4. Settings via MFR-8000 Menus

4-1. Function List

The MFR-8000 front menu display allows you to change or verify settings as shown below.
* The status and alarm display for uninstalled functions will be indicated as "- -".

Function	Indication	Description
MENU EXIT	MENU EXIT	Exits the menu.
ALARM	AC	Displays the AC alarm. (OK: Normal / NG: Alarm)
	DC	Displays the DC alarm. (OK: Normal / NG: Alarm)
	TEMP	Monitors the temperature (OK: Normal / NG: Alarm)
	FAN	ALARM PS: Displays the fan alarm for the power supply unit. (OK: Normal / NG: Alarm) ALARM FAN: Displays the fan alarm for the main unit. (NORMAL / WARNING / ERROR)
	FAIL	Displays the overheat alarm for the power supply unit. (OK: Running / NG: Stopped)
	V1, V2, …	Displays an alarm for the each card voltage (OK: Normal / NG: Alarm)
	CPU2▶COND	Displays the Secondary CPU condition (OK: Normal / NG: Alarm)
	CNFG	Displays the CPU and MTX card startup status. (OK: Startup successful / NG: Startup error)
STATUS	CPU1/2FIRM	Displays firmware versions
	CPU1/2FPGA MTX FPGA	Displays FPGA versions (CPU cards / MTX cards)
	PS	Displays whether the power supply unit is present. (INSTALLED: Present / NONE: Absent)
	CPU	Displays whether the CPU card is present. (INSTALLED: Present / NONE: Absent)
	SLOT	Displays whether an input or output card is present in each slot. (INSTALLED: Present / NONE: Absent)
	TEMP	Monitors the temperature (°C)
	AC	Displays the input voltage of the power supply unit (OK: Normal / NG: Alarm)
	DC	Displays the output voltage of the power supply unit (OK: Normal / NG: Alarm)
	FAN	PS STATUS: Displays the fan alarm for the power supply unit. (OK: Normal / NG: Alarm) FAN STATUS: Displays the fan alarm for the main unit. (NORMAL / WARNING / ERROR) MTX STATUS: Displays the fan alarm for the MTX card. (OK: Normal / NG: Alarm)
	FAIL	Displays the overheating alarm for the power supply unit. (OK: Running / NG: Stopped)
	V1, V2, …	Displays an alarm for the each card voltage (OK: Normal / NG: Alarm)
	CPU2▶COND	Displays the Secondary CPU condition (OK: Normal / NG: Alarm)
SETTINGS	-	Allows you to change the Ethernet, menu display brightness, and reference signal settings, and shut down slots. See section 4-5. "SETTINGS"

4-2. Front Menu Basic Operation

1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8   ALARM ACTIVE/BUSY CONTROL knob
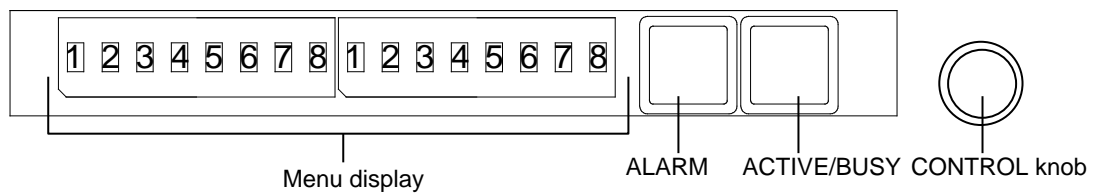
Menu display

1. Activate the menu display
   Hold down the CONTROL knob for at least 3 seconds.

2. Select a menu item
   Turn the CONTROL knob to select a menu item. Press the CONTROL knob after selecting an item to go to the lower menu level.
   * When multiple setting items are shown at the same time
     Repeat the above for the items one by one from the left. (The subject item blinks.)
     To return to the previous item, press the ACTIVE/BUSY button.
     (To return to the above menu level, press the ACTIVE/BUSY button while the leftmost item is blinking.)

3. Confirmation display
   The confirmation display menu appears as shown below.

   A G R E E ? ▶ C A N C E L   O K

   Turn the CONTROL knob to select either CANCEL or OK.
   → Select OK, and press the CONTROL knob to confirm the setting.
   → Select CANCEL, and press the CONTROL knob to cancel the setting and return to the settings display.

4. Setting completion
   The menu display appears as shown below.

   D A T A   S E T   D O N E !

   Press either the CONTROL knob or ACTIVE/BUSY button while the menu is displayed as above to return to the above menu level.

5. Exit the menu
   Select MENU EXIT, and press the CONTROL knob to exit the menu.

4-3. Blinking ALARM Button

Alarm buttons blink to indicate alarms as shown below. Press the ALARM button while the buttons are blinking to see simplified alarm information.

Indication	Description
P S ▶ 1 A L M	Displays the number of power supply units that have an alarm triggered.
F A N ▶ 1 A L M	Displays the number of fans that have an alarm triggered.
C P U ▶ 1 A L M	Displays the number of CPU cards that have an alarm triggered.
M T X ▶ 1 A L M	Displays the number of MTX cards that have an alarm triggered.
R E A R ▶ 1 A L M	Displays the number of REAR cards that have an alarm triggered.
S L O T ▶ 1 A L M	Displays the number of alarms in each slot.
C N F G ▶ 1 A L M	Displays the number of CPU or MTX cards that have a configuration alarm triggered.

*   To see alarm information details, press the CONTROL knob while the above indications are being displayed. (The Alarm menu will be displayed.)

*   Pressing the ALARM button when no alarm is triggered, the menu display will appear as shown below and return to the previous display.

O P E R A T I O N   N O R M A L

4-4. Menu Structure

◆ **If CPU Card is Active:**

```
MENU
EXIT

ALARM ─── ALARM PS ─────┬─ ALM ► PS* ► AC
                        ├─ ALM ► PS* ► DC
                        ├─ ALM ► PS* ► TEMP
                        ├─ ALM ► PS* ► FAN
                        ├─ ALM ► PS* ► FAIL
                        └─ ALARM : PS EXIT      (Exiting menu)

         ALARM FAN ─────┬─ ALM ► FAN*
                        └─ ALARM : FAN EXIT     (Exiting menu)

         ALARM CPU ─────┬─ ALM ► CPU* ► V*
                        ├─ ALM ► CPU2 ► COND
                        └─ ALARM : CPU EXIT     (Exiting menu)

         ALARM MTX ─────┬─ ALM ► MTX ► V*
                        ├─ ALM ► MTX ► FAN
                        └─ ALARM : MTX EXIT     (Exiting menu)

         ALARM REAR ────┬─ ALM ► REAR ► V*
                        └─ ALARM : REAR EXIT    (Exiting menu)

         ALARM SLOT ────┬─ ALM ► SLT* ► V*
                        └─ ALARM : SLOT EXIT    (Exiting menu)

         ALARM CNFG ────┬─ ALM ► CNFG ► F/W*
                        ├─ ALM ► CNFG ► CPU*
                        ├─ ALM ► CNFG ► MTX
                        └─ ALARM : CNFG EXIT    (Exiting menu)

STATUS ─── VERSION ─────┬─ CPU* FIRM ►
                        ├─ CPU* FPGA ►
                        ├─ MTX FPGA ►
                        └─ STATUS : VER EXIT    (Exiting menu)

         PS STATUS ─────┬─ PS* ►
                        ├─ PS* ► AC
                        ├─ PS* ► DC
                        ├─ PS* ► TEMP
                        ├─ PS* ► FAN
                        ├─ PS* ► FAIL
                        └─ STATUS : PS EXIT     (Exiting menu)

         FAN STATUS ────┬─ FAN* ►
                        └─ ALARM : FAN EXIT     (Exiting menu)

         CPU STATUS ────┬─ CPU* ►
                        ├─ CPU2 ► COND
                        ├─ CPU* ► V*
                        ├─ CPU* ► TEMP
                        └─ STATUS : CPU EXIT    (Exiting menu)
```

(Continues to next page)

```
                    ┌─ MTX STATUS ──────┬─ MTX ► V* ────────────┐
                    │                   ├─ MTX ► TEMP ──────────┤
                    │                   ├─ MTX ► FAN ───────────┤
                    │                   └─ STATUS : MTX EXIT ───┘   (Exiting menu)
                    │
                    ├─ REAR STATUS ─────┬─ REAR ► V* ───────────┐
                    │                   ├─ REAR ► TEMP* ────────┤
                    │                   └─ STATUS:REAR EXIT ────┘   (Exiting menu)
                    │
                    ├─ SLOT STATUS ─────┬─ SLOT* ► ─────────────┐
                    │                   ├─ SLOT* ► V* ──────────┤
                    │                   ├─ SLOT* ► TEMP ────────┤
                    │                   └─ STATUS : SLOT EXIT ──┘   (Exiting menu)
                    │
SETTINGS ──┬─ MFR-LAN ──────┬─ IP ADDRESS ──────── IP ►
           │                └─ NET MASK ────────── MASK ►
           │
           ├─ PC-LAN ───────┬─ IP ADDRESS INFO
           │                ├─ NET MASK INFO
           │                ├─ GATEWAY INFO
           │                └─ PC-LAN REBOOT
           │
           └─ MU SETTING ───┬─ MENU BRIGHTNESS ─── BRIGHT ►
                            ├─ REFERENCE ────────┬─ REF ►
                            │                    └─ REF ►
                            │
                            ├─ FORMAT ──────────── FMT ►
                            │
                            ├─ PS2 INSTALL ─────── PS2 ►
                            ├─ SHUT DOWN ────────┬─ SLOT ► *
                            │                    └─ SLOT ► * ►
                            └─ CPU REDUNDANT
```

◆ **If CPU Card is not Active:**

```
┬─ MENU EXIT
├─ CPU REDUNDANT
├─ MENU BRIGHTNESS ─── BRIGHT ►
├─ IP ADDRESS ──────── IP ►
├─ NET MASK ────────── MASK ►
├─ IP ADDR[PC-LAN]
├─ NETMASK[PC-LAN]
└─ GATEWAY[PC-LAN]
```

4-5. SETTINGS

1. MFR-LAN

[IP ADDRESS]

Step	Display	Description
1	I P ▶ 1 9 2 . 1 6 8 . 0 0 1 . 0	Allows you to set the IP address. (For MFR-LAN/LAN (TO RU) connection)

[NET MASK]

Step	Display	Description
1	M A S K ▶ 2 5 5 . 2 5 5 . 0 0 0	Allows you to set the subnet mask. (255.0.0.0 to 255.255.255.254) (For MFR-LAN/LAN (TO RU) connection)

2. MU SETTING

[MENU BRIGHTNESS]

Step	Display	Description
1	B R I G H T ▶ 0 7	Allows you to set the menu display brightness. brightness: 1 (dark) to 15 (bright)

[REFERENCE]

Step	Display	Description
1	R E F ▶ A U T O	Allows you to select how to select a reference signal format. AUTO: Automatic detection MANUAL: Manual selection If set to MANUAL, select a signal below.
2	R E F ▶ B B	Allows you to select a reference signal from BB or TRI-SYNC.

[FORMAT]

Step	Display	Description
1	F M T ▶ 1 0 8 0 5 9 . 9 4 i	Allows you to select a video format

[PS2 INSTALL]

Step	Display	Description
1	P S 2 ▶ I N S T A L L E D	Displays whether the redundant power supply unit is present.

[SHUT DOWN]

Step	Display	Description
1	S L O T ▶ 0 1	Allows you to select a slot to shut down.
2	S L O T ▶ 0 1 ▶ O F F	Select OFF to shut down. Select ON to supply power.

* When selecting the following functions, the confirmation display appears. (Select OK to execute the function.)

■CPU REDUNDANT: Manually switches CPU cards 1 and 2.
                               Requires time for sharing files between CPUs after startup or CPU changeover, during which crosspoint switchings cannot be performed.
■MU REBOOT: Restarts the MFR-8000.
■GUI REBOOT: Restarts the Web-based Control server.
■PC-LAN(IP ADDRESS INFO / NET MASK INFO / GATEWAY INFO):
                               Displays the PC-LAN port settings.
■PC-LAN REBOOT: Restarts the PC-LAN port.

5. Gearbox Feature (MFR-16SDIGB/16SDOGB)

Optional **MFR-16SDIGB**/**16SDOGB** cards support Gearbox features, in which video signal conversions between 12G-SDI and Quad Link 3G-SDI, and between 2SI and SQD are available.

◆ **Gearbox features**
- Conversion between 12G-SDI and Quad Link 3G-SDI (including asynchronous input)
- Conversion between 2SI and SQD
- Clean switch after conversion by AVDL (Automatic Variable Delay Line)
  Also allows Gearbox I/O delay selection (excluding 2SI / SQD conversions)
- Genlock or Line lock synchronization
- H/V ANC data pass-through

5-1. MFR-16SDIGB / 16SDOGB Cards

MFR-16SDIGB / 16SDOGB cards have four built-in Gearboxes that can respectively perform signal conversions and output test patterns.
Four D connectors (1D, 2D, 3D and 4D) can support 12G-SDI signals. If a 12G-SDI signal is input to a Gearbox, other connectors are disabled.
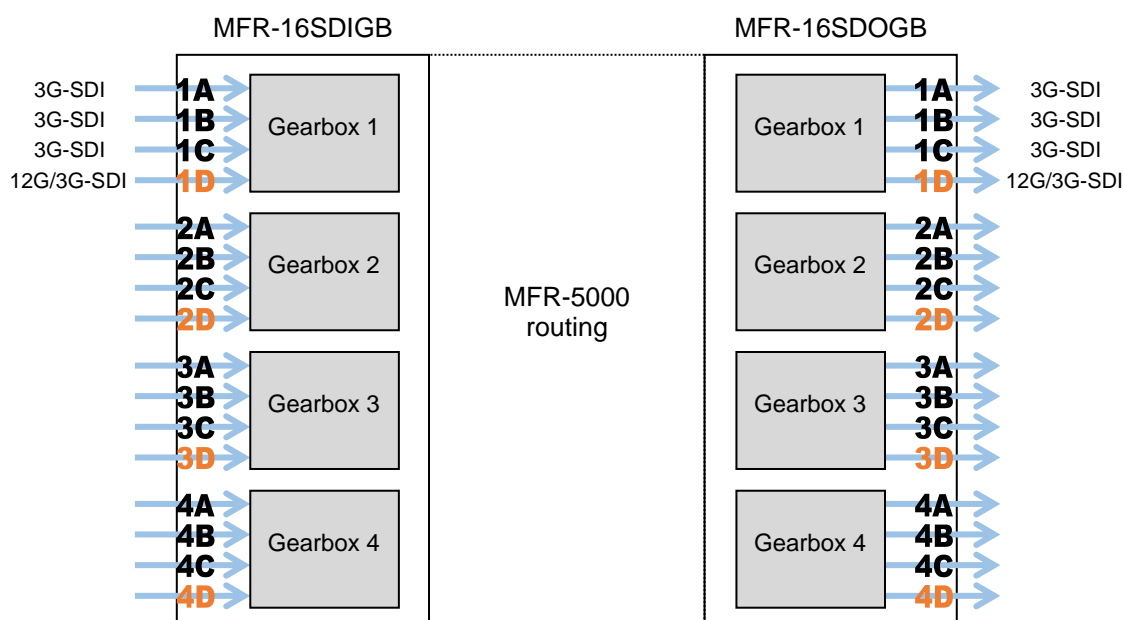
◆ **Supported formats**

Signal format		Video format		Standard
12G-SDI		3840 x 2160/59.94p 3840 x 2160/50p	4:2:2 10-bit	SMPTE ST2082-10
Quad Link 3G-SDI (Level-A)	SQD (Square Division) 2SI (2-Sample Interleave)	3840 x 2160/59.94p 3840 x 2160/50p	4:2:2 10-bit	SMPTE ST425-5

5-2. Available Conversions

◆ **The following input conversions are available on MFR-16SDIGB cards**

<Gearboxes 1 and 3 on MFR-16SDIGB installed on Slot 1-4>

From	To	Lock	Delay(H)[*3]	Total Delay [*4]	Ancillary Data
12G-SDI	3G Quad (2SI)	Line lock [*1]	0.3H~1H	0 frame + ** (H)	Through Mask

<Gearboxes 2 and 4 on MFR-16SDIGB installed on Slot 1-4>

From	To	Lock	Delay(H)[*3]	Total Delay [*4]	Ancillary Data
12G-SDI	3G Quad (2SI)	Line lock [*1]	0.3H~1H	0 frame + ** (H)	Through Mask
		Genlock	0.3H~1H	0 frame + ** (H) 1 frame + Delay (H)	
12G-SDI	3G Quad (SQD)	Line lock [*1]	0.3H~1H	1 frame + Delay (H)	
3G Quad (2SI)	3G Quad (SQD)				
3G Quad (SQD)	3G Quad (2SI)				

<Gearboxes on MFR-16SDIGB installed on Slot 5-8>

From	To	Lock	Delay(H)[*3]	Total Delay [*4]	Ancillary Data
12G-SDI	3G Quad (2SI)	Line lock [*1]	0.3H to 1H	0 frame + ** (H)	Through Mask
		Genlock	0.3H to 1H	0 frame + ** (H) 1 frame + Delay (H)	
			0.5H to 1H	1 frame + 0H	
12G-SDI	3G Quad (SQD)	Line lock [*1][*2] Genlock	0.3H to 1H	1 frame + 0H 1 frame + Delay (H)	
3G Quad (2SI)	3G Quad (SQD)				
3G Quad (SQD)	3G Quad (2SI)				

◆ **The following output conversions are available on MFR-16SDOGB cards**

From	To	Lock	Delay(H)[*3]	Total Delay [*4]	Ancillary Data
3G Quad (2SI)	12G-SDI	Line lock [*1]	0.3H to 1H	0 frame + ** (H)	Through Mask
		Genlock	0.3H to 1H	0 frame + ** (H) 1 frame + Delay (H)	
			0.5H to 1H	1 frame + 0H	
3G Quad (SQD)	12G-SDI	Line lock [*1][*2] Genlock	0.3H to 1H	1 frame + Delay (H)	
3G Quad (2SI)	3G Quad (SQD)				
3G Quad (SQD)	3G Quad (2SI)		0.5H to 1H	1 frame + 0H	

(*1) SDI signal input to the D connector is used as reference. When Line Lock is selected on MFR-16SDOGB cards, video signals are synchronized by inputting signals to all four channels in gearboxes.

(*2) Available only on Gearboxes 2 and 4.

(*3) **Delay (H)** and **Total Delay (H)** indicate amount of delay and their settings correspond to the following adjustable ranges.

Delay (H) setting	Adjustable range	Delay (H) setting	Adjustable range
0.3H	-0.8H to +0.2H	0.8H	-0.3H to +0.7H
0.4H	-0.7H to +0.3H	0.9H	-0.2H to +0.8H
0.5H	-0.6H to +0.4H	1H (1)	-0.1H to +0.9H
0.6H	-0.5H to +0.5H	1H (2)	-0.5H to +0.5H
0.7H	-0.4H to +0.6H		

(*4) If **Total Delay (frame)** is set to "**0 frame**" for both gearboxes, the **different Total Delay (H)** setting is available for the gearboxes.
If **Total Delay (frame)** is set to "**1 frame**" for either one or both gearboxes, the **same Total Delay (H)** setting is required for the gearboxes: **1 frame + 0H** or **1frame + Delay (H).**

5-3. Conversion Settings

In the Web GUI, specify the Gearbox input and output formats and assign input/output physical channels to logical channels. Use Link Settings that allow simultaneous 4-channel operation and facilitate crosspoint switches.

5-3-1. Converting 3G SQD Input to 2SI (MFR-16SDIGB)
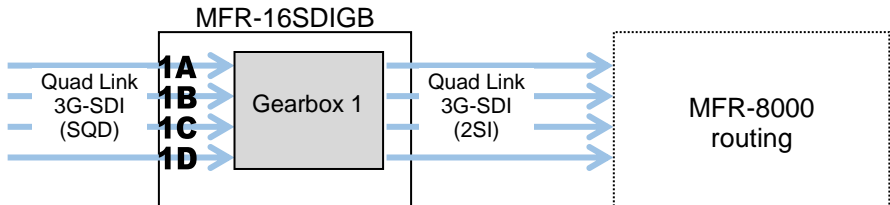
1) Open the **Gearbox Settings** page in the Web GUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-16SDIGB card block. (This example sets Gearbox 2 on the Slot 1 card.)

2) Open the **Source Assignment** page in the Web GUI and assign the physical channels (**SDI1-4**) to logical channels (**SRC 5-8**).

	LogicalNo. / Name	Slot	Physical No.
1	SRC 1	1 MFR-16SDIGB	SDI 5
2	SRC 2	1 MFR-16SDIGB	SDI 6
3	SRC 3	1 MFR-16SDIGB	SDI 7
4	SRC 4	1 MFR-16SDIGB	SDI 8

3) Use a remote control unit or the Crosspoint page in the Web GUI to assign output channels to **SRC1-4**.

5-3-2. Converting 2SI to SQD Output (MFR-16SDOGB)

1) Open the **Gearbox Settings** page in the Web GUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-16SDOGB card block. (This example sets Gearbox 1 on the Slot 9 card.)

2) Open the **Destination Assignment** page in the Web GUI and assign the physical channels (**SDI1-4**) to logical channels (**DST 1-4**).

	LogicalNo. / Name	Slot	Physical No.
1	DST 1	1:MFR-16SDOGB	SDI 1
2	DST 2	1:MFR-16SDOGB	SDI 2
3	DST 3	1:MFR-16SDOGB	SDI 3
4	DST 4	1:MFR-16SDOGB	SDI 4

3) Use a remote control unit or the Crosspoint page in the Web GUI to assign input channels to **DST1-4**.

5-3-3. Converting 12G-SDI Input to 3G-SDI 2SI (MFR-16SDIGB)
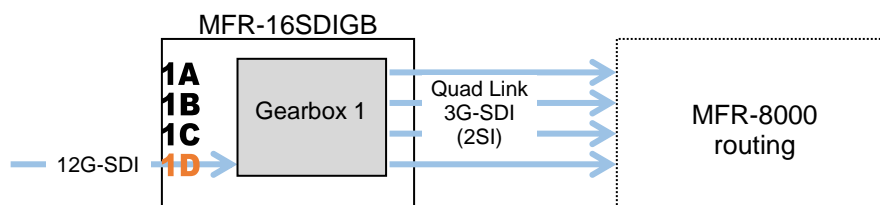
1) Open the **Gearbox Settings** page in the Web GUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-16SDIGB card block. (This example sets Gearbox 1 on the Slot 1 card.)

2) Open the **Source Assignment** page in the Web GUI and assign the physical channels (**SDI 4 Link A to D**) to logical channels (**SRC 1-4**).

	LogicalNo. / Name	Slot	Physical No.
1	SRC 1	1:MFR-16SDIGB	SDI 4 Link A
2	SRC 2	1:MFR-16SDIGB	SDI 4 Link B
3	SRC 3	1:MFR-16SDIGB	SDI 4 Link C
4	SRC 4	1:MFR-16SDIGB	SDI 4 Link D

* Four channel assignments are required for 12G-SDI signals in the same manner as for Quad-Link 3G-SDI signals.

3) Use a remote control unit or the Crosspoint page in the Web GUI to perform the crosspoint switches.

5-3-4. Converting 3G-SDI SQD to 12G-SDI Output (MFR-16SDOGB)
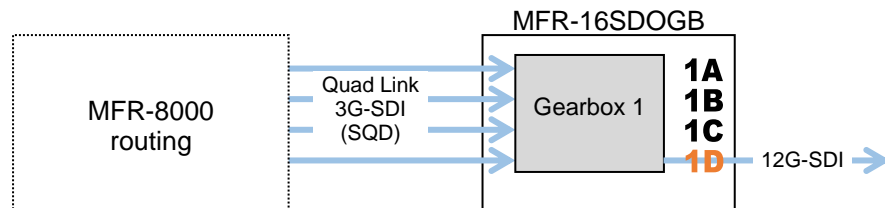
1) Open the **Gearbox Settings** page in the Web GUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-16SDOGB card block. (This example sets Gearbox 1 on the Slot 9 card.)
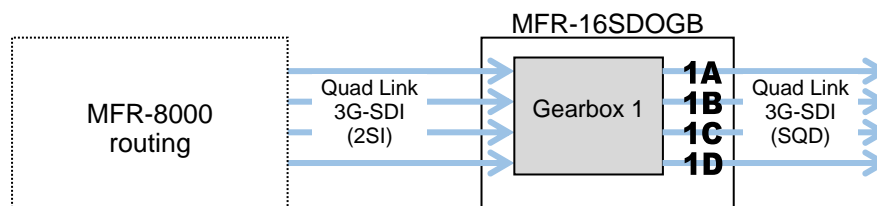

2) Open the **Destination Assignment** page in the Web GUI and assign the physical channels (**SDI 4 Link A to D**) to logical channels (**DST 1-4**).

	LogicalNo. / Name	Slot	Physical No.
1	DST 1	1:MFR-16SDOGB	SDI 4 Link A
2	DST 2	1:MFR-16SDOGB	SDI 4 Link B
3	DST 3	1:MFR-16SDOGB	SDI 4 Link C
4	DST 4	1:MFR-16SDOGB	SDI 4 Link D

*   Four channel assignments are required for 12G-SDI signals in the same manner as for Quad-Link 3G-SDI signals.

3) Use a remote control unit or the Crosspoint page in the Web GUI to perform the crosspoint switches.

5-3-5. Payload ID

◆ **Adding Payload ID information to Output Signals.**
Select Payload ID information source for output signals.
Insert: Data created for output signals.
Through: Data embedded to input signals.
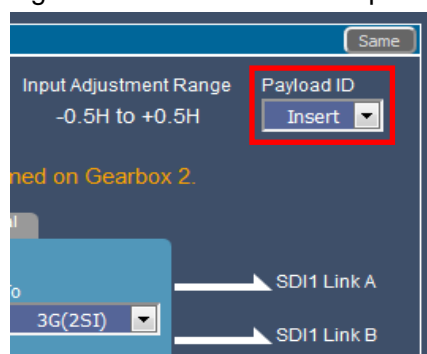
◆ **Adding 8K Quad-Link Payload ID Information.**

When converting 3G Quad-Link to 12G-SDI, Payload ID information for 8K Quad-Link (In compliance with SMPTE 2082-1) is able to be added to 12G-SDI output. Set as shown below.

From	To	Payload ID	Payload ID Information to Be Added
3G Quad-Link (2SI or SQD)	12G(8K Link1)	Insert	8K Quad-Link, Link1
	12G(8K Link2)	Insert	8K Quad-Link, Link2
	12G(8K Link3)	Insert	8K Quad-Link, Link3
	12G(8K Link4)	Insert	8K Quad-Link, Link4
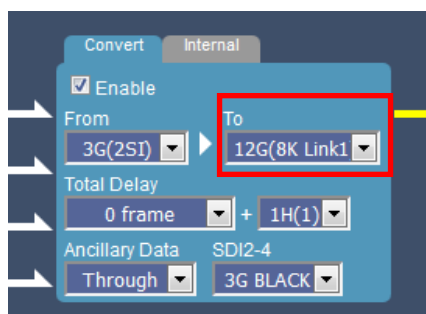
When adding 8K Quad-Link Payload ID information to Gearbox 1 (Gearbox 3), make sure to also add the information to Gearbox 2 (Gearbox 4) as shown below. Use different Link Numbers.

Ex.)

Gearbox	From	To (Yes)	To (No)
GB1	3G(SQD)	12G(8K Link1)	12G
GB2	3G(2SI)	12G(8K Link2)	12G(8K Link2)
GB3	3G(SQD)	12G	12G
GB4	3G(2SI)	12G	12G(8K Link3)

5-3-6. 3G-SDI BNC Output Settings

When converting 3G Quad-Link to 12G-SDI, 3G-SDI Black or 12G-SDI Link 1 are selectable for remaining 3 SDI output signals.
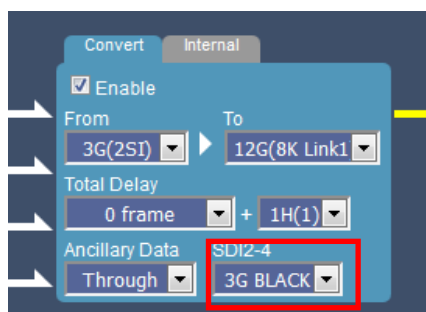
6. Serial / LAN Command Control

Up to 20 external devices can be connected to an MFR Main Unit (including MFR-GPI serial ports) through LAN or serial interface.

6-1. Serial Interface

Crosspoint switchover and tally output can be controlled via the SERIAL ports on the MFR Series main unit or MFR GPI.

6-2. LAN Interface

The MFR Series main unit is able to connect to a third-party automatic control system via the RJ-45 port (PC-LAN port). The TCP/IP communication protocol is supported. The control PC will be the Client, and the MFR Series main unit will be the Server.
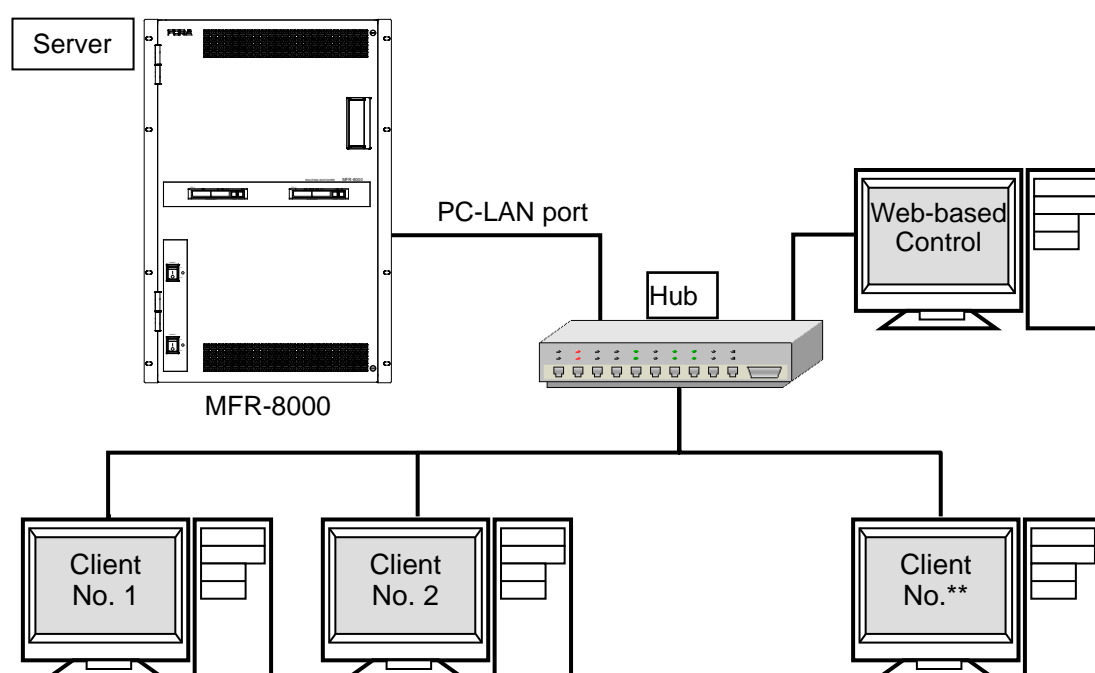
◆ **Basic specifications**

tem	Description
IP address (PC-LAN port)	Primary LAN (PC-LAN CPU1) default IP address: 192.168.1.12 Secondary LAN (PC-LAN CPU2) default IP address: 192.168.1.13※ (Subnet Mask: 255.255.255.0)
Port number	Setting range: 23, 49152 to 65534 (Default: 23)
Number of PCs	Max. 16
Response / Resending	Wait before sending next command (Resend if the Echo is not returned.)
Login password	None
Communication protocol	TCP/IP, Control PC: Client, MFR-8000: Server Crosspoint Remote Control using ASCII code.
Command protocol	Crosspoint Remote Control protocol

*   When a redundant CPU is configured, a client should connect to both LAN ports (PC-LAN CPU1 and PC-LAN CPU2) and send commands to the ports respectively. When the system functions normally, the secondary port (PC-LAN CPU2) do not respond to commands. But if an error occurs in the CPU1 system, the secondary port will take over the primary port and respond to commands.

6-3. Control Commands

Although the protocols listed below support both serial and LAN connections, some commands can only be sent over a LAN.

◆ Control command list

	Function	Serial	LAN *1	Protocol *2
1	Commands (S?) for requesting the crosspoints list	Yes	Yes	Crosspoint remote control / Crosspoint remote control 2
2	Commands (X?) for requesting information on crosspoints (by specifying a destination and level.)	Yes	Yes	
3	Commands (X:) for switching over a crosspoint (single channel)	Yes	Yes	
4	Commands for switching over crosspoints (multi-channel simultaneous switchover)	Yes	Yes	
5	Commands (W:) for locking a destination	Yes	Yes	
6	Commands (z:) for reinitializing a unit	Yes	Yes	
7	Commands (K?) for requesting input/output channel names	-	Yes	Crosspoint remote control 2
8	Commands (A?) for requesting CPU status.	-	Yes	
9	Commands (W?) for requesting Destination Lock status.	-	Yes	
10	Commands (K:) for importing signal names	-	Yes	
11	Commands for requesting System Size	Yes	Yes	Crosspoint remote control / Crosspoint remote control 2
12	Commands for setting video format (reference and/or switching point).	-	Yes	Crosspoint remote control 2

*1 When commands are sent via LAN, an Echo, Prompt, S response and other response messages may be included in a single packet or divided into two or more packets. Therefore, do not process commands in a per packet basis but a per stream basis.

*2 A command protocol should be selected in the [Web-based Control: **Port Settings** page].

◆ Command formats

Func.	Control command	Command response	Ref.
1	@[sp]S?<Lvl>	S:<Lvl><Dest>,<Src>	—
2	@[sp]X?<Lvl><Dest>	S:<Lvl><Dest>,<Src>	—
3	@[sp]X:<Lvls>/<Dest>,<Src>	S:<Lvl><Dest>,<Src> C:<Lvls>/<Dest>,<Src>[…..[S<Salvo number>][L<Link number>]]:I<ID>	—
4	**Clear a preset crosspoint.** @[sp]**B:C**		—
	Preset a crosspoint. @[sp]**P:**<Lvl>/<Dest>,<Src>		
	Read a preset crosspoint specifying a level and destination. @[sp]**P?**<Lvl><Dest>	V:<Lvl><Dest>,<Src>	
	Read preset crosspoints for all channels in the specified level. @[sp]**V?**<Lvl>	V:<Lvl><Dest>,<Src>	
	Perform the preset crosspoints simultaneously. @[sp]B:E	S:<Lvl><Dest>,<Src> **C:**<Lvls>/<Dest>,<Src>[…..[S<Salvo number>][L<Link number>]]:I<ID>	—
5	**LOCK ALL units.** @[sp]**W:**<Lvl>/<Dest>,<ID>,1	W!<Lvl><Dest>,<ID>,1	—
	LOCK OTHER units. @[sp]**W:**<Lvl>/<Dest>,<ID>,2	W!<Lvl><Dest>,<ID>,2	—
	Disable LOCK. @[sp]**W:**<Lvl>/<Dest>,<ID>,0	W!<Lvl><Dest>,<ID>,0	—
6	@[sp]z:<Lvls>	S:<Lvl><Dest>,<Src> C:<Lvls>/<Dest>,<Src>[…..[S<Number of crosspoints in Salvo>][L<Number of Links>]]:I<ID>	—

7	@[sp]K?<S or D><A or K>,<Offset>		K:<S or D><A or K><No.>,<Dat>	6-3-3
8	@[sp]A?	If CPU is active:	@[sp]A:<ID>	6-3-4
		If CPU is passive:	(No response)	
9	@[sp]W?<Lvl>,<Dest>		W!<Lvl><Dest>,<ID>,0-2* *0: Nothing locked 1: LOCK ALL 2: LOCK OTHER	6-3-5
10	K:<S or D><S or L or A><No.>,<Dat> No : Start channel number Dat: Channel names using hex characters (max. 128 bytes).			6-3-6
11	@[sp]F?<Lvl>		F:<Lvl><Dst Size>,<Src Size>/< Dst Size >,<Src Size>	6-3-7
12	**Sets video format (reference and/or switching point) settings.** @[sp]UF:<YY>/<R#>,<S$>		UF!<YY>/<R#>,<S$>	6-3-8
	Performs the settings. @[sp]UE:A		UR!W UR!<YY>/<R#>,<S$>	
			UR!E(Error response)	
	Cancels the settings. @[sp]UE:C		UR!C	

*   [sp] indicates a space.

*   Commands must end with a carriage return (ASCII code 0x**0D**) only or carriage return and line feed (ASCII code 0x**0A**). MFR units add **a carriage return** and **line feed** in front of and at the end of reply messages.

Command parameters and setting range

<Lvl>	0 - 7	Allows you to specify the level to switch crosspoints. * When in single-level operation.
<Lvls>	0 - 7	Allows you to specify the levels to switch crosspoints. * When in multiple-level operation
<Dest>	000-1FF	Allows you to specify the crosspoint switchover destination.
<Src>	000 - 3FF	Allows you to specify the source of crosspoint switchover.
<ID>	0 - FE	Unit ID. The ID must be different from that of other devices in the same network. Use **1** to **FE** for ID numbers. The host returns **0** when the lock is released.

*   All command values are in hexadecimal, starting from 0 (zero).
   (For example, Source "**16**" is represented as <Src>"**F**.")

*   If levels are not in use, set <Lvl> or <Lvls> to "0"(zero).

6-3-1. Command Responses

● **Echo and Prompt**

Responses will be sent as shown below when receiving commands:

A command is received.	
↓	
Echo	@[sp]X:<Lvls>/<Dest>,<Src>[CR]
↓	
Prompt	[CR][LF]>

*   MFR units respond with an Echo Reply with the same data that they received. Therefore, echo reply messages end with [CR][LF] or [CR] only. If echo messages with [CR][LF] are received, only [LF] composes the second line.

*   MFR units read a command, ended with a newline, and return a prompt to notify that they are ready to receive a new command.

*   A carriage return and line feed are not added at the end of "Echo Reply" and "Prompt"

● **"C" responses (Commands 1-6)**
   A "C" response is sent as shown below when a control command is received:

| [CR][LF]C:<Lvls>/<Dest>,<Src>[···[S<**Salvo number**>][L<**Link number**>]]:I<ID>[CR][LF] |

*   C responses are sent to all the terminals in the system.

Parameter	Setting range	Description
<Salvo number >	1−FFF	The number of crosspoints that are to be changed simultaneously by Salvo settings. A response if 3 crosspoints are to be changed simultaneously: **C:0/0,0...S2:IA**
<Link number>	1−FFF	The number of crosspoints that are to be changed simultaneously by Link settings. A response if 2 crosspoints are to be changed simultaneously: **C:0/0,2...L1:IA**

● **"S" responses (Commands 1-6)**
   An "S" response is sent as shown below when crosspoints are switched by a command.

| [CR][LF]C:<Lvls>/<Dest>,<Src>[···[S<**Salvo number**>][L<**Link number**>]]:I<ID>[CR][LF] |

*   If a crosspoint is switched by an X or B command, its "S" response is sent to all the terminals in the system. However, if any crosspoints are not switched (specifying the same crosspoint as the current one), its "S" response is sent only to the terminal that sent the command.
*   C responses are sent before S responses in some cases.
*   A command is received from another terminal while a B or X command is processed, MFR units send "S" response messages to the terminals, notifying only the latest crosspoint states.
*   A crosspoint switch command is not performed if the relevant crosspoint is locked or inhibited to change.

Ex. 1) When **Source 5** is selected for **Destination 3** in **Level 1:**
(Function 3 in the previous page)

(A)	@ X:0/2,4[CR] [CR][LF]>
(B)	[CR][LF] C:0/2,4:IA[CR][LF]
(C)	[CR][LF] S:02,4[CR][LF]

Terminal display:

```
@ X:0/2,4
>
C:0/2,4:IA

S:02,4
```

Ex. 2) When Source 113 is selected for Destination 49 in Levels 2 to 7:
(Function 3 in the previous page)

(A)	@ X:123456/30,70[CR] [CR][LF]>
(B)	[CR][LF] C:123456/30,70...S5:IA[CR][LF]
(C)	[CR][LF] S:130,70[CR][LF]
(C)	[CR][LF] S:230,70[CR][LF]
(C)	[CR][LF] S:330,70[CR][LF]
(C)	[CR][LF] S:430,70[CR][LF]
(C)	[CR][LF] S:530,70[CR][LF]
(C)	[CR][LF] S:630,70[CR][LF]

Terminal display:

```
@ X:123456/30,70
>
C:123456/30,70…S5:IA

S:130,70

S:230,70

S:330,70

S:430,70

S:530,70

S:630,70
```

* [CR] and [LF] represent Carriage Return (0x0D) and Line Feed (0x0A) respectively.

6-3-2. Receiving Responses (Commands 1-6)

● **Timeout Waiting for Command Response from MFR**

Set the **timeout** period (maximum permitted time until its response returns from the MFR unit) to **1 second** for short message commands and to **5 seconds** for long message commands.

● **If Sending Commands Successively:**

-For "**X:**", "**B:C**", "**P:**" and "**W:**" commands, send the next command **after** a **prompt** returns.

-For "**S?**", "**X?**", "**P?**", "V?", "**B:E**" and "**Z:**" commands, send the next command **after** a **prompt and reply messages** return.

-For "**S?**" and "**Z:**" commands as well as "**V?**" and "**B:E**" commands after executing many preset commands, send the next command **after** having finished receiving **all strings** of reply messages.

Ex. 1)

Allows to send the next command when receiving a prompt.

Resends the previous command when the timeout period (5 seconds) have elapsed without reply after sending a command.

Ex. 2)

Allows to send the next command when receiving a prompt.

Resends the previous command when the timeout period (5 seconds) have elapsed without reply after sending a command.

Recognizes and uses "S" responses as tallies (crosspoint states).

Ex. 3)

Allows to send the next command when receiving a prompt.

Recognizes and uses "S" responses as tallies (crosspoint states).

Resends the previous command when the timeout period (5 seconds) have elapsed without reply after sending a command.

Sets the maximum number of continuous resendings, because crosspoints cannot be changed if they are locked or inhibited to change.

Ex. 4)

Allows to send the next command when receiving a prompt.

Resends the previous command when the timeout period (5 seconds) have elapsed without reply (echo) after sending a command.

Ex. 5)

Allows to send the next command when receiving a prompt.

● **Response Message Evaluation Example:**

```
Response message received
        │
        ▼
    New line? ────────────────┐              [CR] or [LF]
      │  Yes    No            ▼
      │                   Prompt?            Is the 1st character of a line Prompt?
      │              Yes  │  No              - Prompts are not added to line buffers.
      │                   ▼
      │              Add to the line buffer
      │                        │
      ▼ ──────────────────────►
Processing S Response                        Does the line buffer begin with **S:**?
      │                                      - Other characters are recognized and used as tally.
      │                                      - Characters are cleared, if unnecessary.
      ▼
Processing C Response                        Does the line buffer begin with **C:**?
      │                                      - Other characters are received as a processed
      │                                        command.
      │                                      - Characters are cleared, if unnecessary.
      ▼
Verifying Echo Reply                         Add the rest of characters to the echo buffer,
      │                                      excluding S and C responses Newline and Prompt.
      │                                      (The echo buffer is cleared when sending a new
      │                                      command.)
      │                                      - Checks that they are identical to the sent command.
      │                                      - Characters are cleared, if unnecessary.
      ▼
Clears the line buffer
      ▼◄──────────────────────
Waiting the next message.
```

- **If Commands are Overlapped:**

Two or more commands are sent from different terminals (via serial or LAN interface, or Remote Control units), all command results (C and S responses) are sent to all these terminals from the MFR.

The following command examples shows how overlapped commands are processed.

Ex.) Assume that the following commands are overlapped:
  Terminal 1 sent "@ X:0/2,4."
  Terminal 2 sent "@ X:123456/30,70."

Message examples returned to Terminal 1

1-(A)	@ X:0/2,4[CR] [CR][LF]>	Terminal display	@ X:0/2,4
1-(B)	[CR][LF] C:0/2,4:IA[CR][LF]		> C:0/2,4:IA
2-(B)	[CR][LF] C:123456/30,70...S5:IA[CR][LF]		C:123456/30,70...S5:IA
1-(C)	[CR][LF] S:02,4[CR][LF]		S:02,4
2-(C)	[CR][LF] S:130,70[CR][LF]		S:130,70
2-(C)	[CR][LF] S:230,70[CR][LF]		S:230,70
2-(C)	[CR][LF] S:330,70[CR][LF]		S:330,70
2-(C)	[CR][LF] S:430,70[CR][LF]		S:430,70
2-(C)	[CR][LF] S:530,70[CR][LF]		S:530,70
2-(C)	[CR][LF] S:630,70[CR][LF]		S:630,70

Message examples returned to Terminal 2

2-(A)	@ X:123456/30,70[CR] [CR][LF]>	Terminal display	@ X:123456/30,70
1-(B)	[CR][LF] C:0/2,4:IA[CR][LF]		> C:0/2,4:IA
2-(B)	[CR][LF] C:123456/30,70...S5:IA[CR][LF]		C:123456/30,70...S5:IA
1-(C)	[CR][LF] S:02,4[CR][LF]		S:02,4
2-(C)	[CR][LF] S:130,70[CR][LF]		S:130,70
2-(C)	[CR][LF] S:230,70[CR][LF]		S:230,70
2-(C)	[CR][LF] S:330,70[CR][LF]		S:330,70
2-(C)	[CR][LF] S:430,70[CR][LF]		S:430,70
2-(C)	[CR][LF] S:530,70[CR][LF]		S:530,70
2-(C)	[CR][LF] S:630,70[CR][LF]		S:630,70

* C responses are sent before S responses in some cases.

6-3-3. Channel Name Request Commands (7)

K? commands allow you to obtain Source and Destination names in ASCII and/or in Kanji set in the MFR Web-based Control menu.

◆ **Command Format**

Command	Command response
@[sp]K?<S or D><A or K>,<Offset>	K:<S or D><A or K><No.>,<Dat>

Commands

BYTE No.	1	2	3	4	5	6	7	8-10	11
Command	@	[sp]	K	?	S	A	,	000-3FF	CR
					D	K		000-1FF	

Command response

BYTE No.	1	2	3	4	5	6	7-9	10	11-		
Response	CR	LF	K	:	S	A	000-3FF	,		CR	LF
					D	K	000-1FF				

Command Response	BYTE 5	<S or D> Select between S (Source) or D (Destination) S: Source, D: Destination
	BYTE 6	<A or K> Select A (Ascii) or K (Kanji) for names.
Command	BYTE8-10	<Offset> Specify the start number of channels. Source: 000-3FF, Destination: 000-1FF
Response	BYTE7-9	<No.> Indicates the channel number. Source: 000-3FF, Destination: 000-1FF
Response	BYTE11-	<Dat> Indicates the short or long channel name using hex characters (max. 128 bytes). Character code for Ascii names: **Ascii** Character code for Kanji names: **UTF-8**
Command	CR	Carriage return
Response	LF	Line feed

Up to 32 channel names can be obtained per a single request.

Note that the number of request channels exceeds the system maximum size, no data will return for the exceeded channels.

► See the [Web-based Control: **SystemSize/LevelName** page].

◆ **Command Example 1: Requesting the Source Channel 1 Ascii Name**

➢ Web-based Control (Source Name menu)

➢ Terminal display

Command	@ K?SA,000

Response	@ K?SA,000	Echo
	K:SA**000**,5352432031	Ascii Name for Source **Channel 1** is SRC 1.
	K:SA**001**,5352432032	Ascii Name for Source **Channel 2** is SRC 2.
	K:SA**002**,5352432033	Ascii Name for Source **Channel 3** is SRC 3.
	I	
	K:SA**01F**,5352433332	Ascii Name for Source **Channel 32** is SRC32.
	>	Prompt

➢ Response details

K:	S	A	000,	53	52	43	20	31
	Source	ASCII	Channel 1	S	R	C	[sp]	1

◆ **Command Example 2: Requesting the Destination Channel 101 Kanji Name**

➢ Web-based Control (Destination Name menu)

➢ Terminal display

Command	@ K?DK,064

Response	@ K?DK,064	Echo
	K:DK**064**,E587BAE58A9BEFBC91EFBC90EFBC91	Kanji Name for Destination **Channel 101** is 出力101.
	K:DK**065**,E587BAE58A9BEFBC91EFBC90EFBC92	Kanji Name for Destination **Channel 102** is 出力102.
	K:DK**066**,E587BAE58A9BEFBC91EFBC90EFBC93	Kanji Name for Destination **Channel 103** is 出力103.
	I	
	K:DK**083**,E587BAE58A9BEFBC91EFBC93EFBC92	Kanji Name for Destination **Channel 132** is 出力132.
	>	Prompt

➢ Response details

K:	D	K	064,	E587BA	E58A9B	EFBC91	EFBC90	EFBC91
	Destination	Kanji	Channel 101	出	力	1	O	1

K:	D	K	065,	E587BA	E58A9B	EFBC91	EFBC90	EFBC92
	Destination	Kanji	Channel 102	出	力	1	O	2

◆ Command Example 3: Requesting the Source Channel 65 Kanji Name

➢ Web-based Control (Source Name menu)

➢ Terminal display

Command	@ K?SK,040

Response	@ K?SK,040	Echo
	K:SK**040**,E382ABE383A1E383A9EFBC91	Kanji Name for Source **Channel 65** is カメラ1.
	K:SK**041**,E382ABE383A1E383A9EFBC92	Kanji Name for Source **Channel 66** is カメラ2.
	K:SK**042**,E382ABE383A1E383A9EFBC93	Kanji Name for Source **Channel 67** is カメラ3.
	K:SK**043**,E382ABE383A1E383A9EFBC94	Kanji Name for Source **Channel 68** is カメラ4.
	K:SK**044**,	Kanji Name for Source **Channel 69** is empty.
	K:SK**045**,	Kanji Name for Source **Channel 70** is empty.
	K:SK**046**,	Kanji Name for Source **Channel 71** is empty.
	K:SK**047**,E382B5E383BCE38390E383BCEFBCA1	Kanji Name for Source **Channel 72** is サーバーA.
	I	
	K:SK**05F**,	Kanji Name for Source **Channel 96** is empty.
	>	Prompt

K:	S	K	040,	E382AB	E383A1	E383A9	EFBC91
	Source	Kanji	Channel 68	カ	メ	ラ	1

K:	S	K	044,	
	Source	Kanji	Channel 69	(Empty)

K:	S	K	047,	E382B5	E383BC	E38390	E383BC	EFBCA1
	Source	Kanji	Channel 72	サ	—	バ	—	A

6-3-4. CPU Status Request Command (8)

This command allows you to indicate which CPU is active in the MFR-8000.

◆ Command format

Control command	Command response
@[sp]A?	@[sp]A:<ID>

Control command

BYTE No.	1	2	3	4
Command	@	[sp]	A	?

Command response

BYTE No.	1	2	3	4	5
Response	@	[sp]	A	:	<ID>

<ID>: Unit ID number (01-FE)

◆ Command Response
There are two response types whether the CPU is active or passive state.
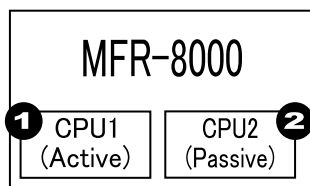
If the CPU is active:

Response	@ A?	Echo
	A:A	Unit ID number is 10 (0x0A)
		New line
	>	Prompt

If the CPU is passive:

Response		No echo, response or prompt

6-3-5. Destination Lock Status Request Command (9)

This command (W?) allows you to indicate the destination lock status in the MFR system.

◆ **Command format**

Control command	Command response
@[sp]W?<Lvl>,<Dest>	@[sp]W!<Dest>,<ID>,

Control command

BYTE No.	1	2	3	4	5	6	7	8
Command	@	[sp]	W	?	<Lvl>	,	<Dest>	CR

<Dest>: Destination channel number

Command response

BYTE No.	1	2	3	4	5	6	7	8	9	10	11	12
Response	CR	LF	W	!	<Lvl>	<Dest>	,	<ID>	,	0	CR	LF
										1		
										2		

◆ **Command Response Examples**

If Destination 1 is locked by ID10 Unit using LOCK, Destination 1 status returns as shown below:

Response	@ W?0,0	Echo
	W!00,A,1	Dest 1 is locked by ID10 (0x0A) unit using LOCK ALL.
		CR LF
	>	Prompt

If Destination 2 is locked by ID11 Unit using LOCK OTHER, Destination 2 status returns as shown below:

Response	@ W?0,1	Echo
	W!01,B,2	Dest 2 is locked by ID11 (0x0B) unit using LOCK OTHER.
		CR LF
	>	Prompt

If Destination 3 is not locked, Destination 3 status returns as shown below:

Response	@ W?0,2	Echo
	W!02,0,0	Dest 3 is not locked.
		CR LF
	>	Prompt

6-3-6. Channel Name Import Commands (10)

K: commands allow you to import Source and Destination names from the device that sends K: commands to the MFR system.

◆ Command Format

Command	Command response
K:<S or D><S or L or A ><No.>,<Dat>	Echo Prompt

Commands

BYTE No.	1	2	3	4	5-7	8	9	
Command	K	:	S	S	000-3FF	,		CR
			D	L	000-1FF			
				A				

BYTE 3	<S or D> Select between S (Source) or D (Destination)
BYTE 4	<S or L> Select the destination to which names are imported. S: Source Name or Destination Name, ID Name (Kanji) fields on the Web GUI. L: Source Name or Destination Name, Import Name fields on the Web GUI. A: Source Name or Destination Name, Name (ASCII) fields on the Web GUI.
BYTE5-7	<No.> Indicates the channel number. Source: 000-3FF, Destination: 000-1FF
BYTE9-	<Dat> Channel names Strings in Hex characters (max. 128 bytes). Character code: UTF-8
CR	Carriage return

6-3-7. System Size Request Command (11)

F? Commands allow you to obtain MFR-8000 system size.

◆ Command Format

Command	Command response
@[sp]F?<Lvl>	F:<Lvl><Dst Size>,<Src Size>/< Dst Size >,<Src Size>

Commands

BYTE No.	1	2	3	4	5
Command	@	[sp]	F	?	<Lvl>

Command response

BYTE No.	1	2	3	4	5	6	7	8	9	10
Response	F	:	<Lvl>	<Dst Size>	,	<Src Size>	/	<Dst Size>	,	<Src Size>

<Dst Size>: Destination channel number
<Src Size>: Source channel number

◆ Command Example

Response	@ F?0	Echo
	F:0FF,FF/FF,FF	256 destination / 256 source channel numbers.
		CR LF
	>	Prompt

6-3-8. Video Format Commands (12)

Video Format Commands allow you to change router video format. The router restarts automatically when commands are sent out. The commands can also change reference and switching point settings.

◆ **Command Format**

	Command description	Commands	Command response
(1)	Sets video format, reference and/or switching point beforehand.	@[sp]UF:<YY>/<R#>,<S$> *1	UF!<YY>/<R#>,<S$>
(2)	Performs the set changes.	@[sp]UE:A	UR!W *2 UR!<YY>/<R#>,<S$>
			UR!E (error response)
(3)	Cancels the set changes.	@[sp]UE:C	UR!C

*1 Reference and Switching points are non-compulsory. When they are not input, present settings are output for command response.

*2 "UR!W" is output at 5-seconds intervals after receiving "@[sp]UE:A." When execution environment is ready, "UR!<YY>/<R#>,<S$>" is output.

Commands

BYTE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(1)	@	[sp]	U	F	:	<YY>		/	<R#>		,	<S$>		CR
(2)	@	[sp]	U	E	:	A	CR							
(3)	@	[sp]	U	E	:	C	CR							

Parameters

<YY>	Video format	**00**: 1080/59.94i **01**: 1080/59.94p **02**: 1080/60i **03**: 1080/60p **04**: 1080/50i **05**: 1080/50p **06**:720/60p	**07**:720/59.94p **08**:720/50p **09**: 1080/30p **0A**: 1080/29.97p **0B**: 1080/25p **0C**: 1080/24p **0D**: 1080/23.98p	**0E**: 1080/30psF **0F**: 1080/29.97psF **10**: 1080/25psF **11**: 1080/24psF **12**: 1080/23.98psF **13**: NTSC **14**: PAL
<R#>	Reference	**RA**: Auto	**RB**: B.B	**RT**: Tri-Sync
<S$>	Switching point	**SF**: Frame	**SO**: Odd	**SE**: Even

* Commands are not executed if no video format is set or the current video format is set for preset.

◆ **Command Example 1**

Changes Video Format to **720/59.94p**.

Command	Command response
@[sp]UF:07[CR]	[CR][LF]UF!07/RA,SF[CR]
@[sp]UE:A[CR]	[CR][LF]UR!W [CR][LF]UR!07/RA,SF[CR] (The router automatically restarts.)

◆ **Command Example 2**

Changes Video Format to **1080/59.94p**, Reference to **Tri-level Sync** and Switching Point to **Field**.

Command	Command response
@[sp]UF:01/RT,SF[CR]	[CR][LF]UF!01/RT,SF[CR]
@[sp]UE:A[CR]	[CR][LF]UR!W [CR][LF]UR!01/RT,SF[CR] (The router automatically restarts.)

7. Troubleshooting

If any of the following problems occur during operation of your MFR-8000, proceed as indicated below to see if the problem can be corrected before assuming a unit malfunction has occurred.

IMPORTANT
If the problem cannot be corrected by performing the procedures below, turn the unit off and then on again. If this still does not correct the problem, contact your dealer.

Problem	Check	Remedy
No image output.	Are there signal inputs to the video input connectors?	Input video signals to the video input connectors.
	Are cables properly connected for the signal inputs?	Connect cables properly.
	Is the crosspoint set properly?	Set crosspoints properly.
Unable to control using the remote control panel.	Is the LAN cable properly connected?	Properly connect the LAN cable.
	Is the RU Info page in the Web-based Control indicating NG?	Check the item that is indicated as NG. However, if the Voltage is indicated as NG, contact your FOR-A agent. See the Web-based Control Operation Manual for details.
The secondary CPU is active.	Are both MFR-LAN (CPU1) and MFR-LAN (CPU2) properly connected to the network? (Check the cable and Ethernet hub connections.)	Connect both MFR-LAN (CPU1) and MFR-LAN (CPU2) to the network correctly.
	If network connections are properly made, turn unit power OFF then ON again.	Consult your FOR-A reseller if the secondary CPU is still active after restarting.

8. Specifications and Dimensions

8-1. Unit Specifications

8-1-1. MFR-8000

Video Formats	
12G-SDI	2160/59.94p, 2160/50p
3G-SDI	1080/60p, 1080/59.94p, 1080/50p
HD-SDI	1080/60i, 1080/59.94i, 1080/50i, 1080/30p, 1080/30PsF, 1080/29.97p, 1080/29.97PsF, 1080/23.98p, 1080/23.98PsF, 1080/25p, 1080/25PsF, 1080/24PsF, 1080/24p, 720/60p, 720/59.94p, 720/50p
SD-SDI	525/60, 625/50
Matrix Size	Min. 16 x 16 to Max. 256 x 256 + Monitor OUT x 4 Number of input slots: 16 Number of output slots: 16 (Expandable on a 16-channel basis)
Video Input	
MFR-16SDIA	SDI Input Card: 75 ohm, BNC x 16 (16 cards Max.) Compliant with the following (75Ω BNC) - SMPTE 424M (3G-SDI) - SMPTE 292M (HD-SDI) - SMPTE 259M (SD-SDI) - DVB-ASI Cable Equalization 3G/HD-SDI: 100 m (5C-FB cable) SD-SDI: 200 m (5C-2V cable)
MFR-16SDIGB	SDI Input Card - BNC x 4 (12G-SDI or 3G-SDI) - BNC x 12 (3G-SDI) Compliant with the following (75Ω BNC) - SMPTE ST 2082-10 (12G-SDI) - SMPTE ST 425-5 (Quad Link 3G-SDI) I/O delay selection Delay (H) (0.3H-1H), 1 frame, 1 frame+ Delay (H)
Video Output	
MFR-16SDO	Output Card: 75 ohm, BNC x 16 (Max. 16 cards) Compliant with the following (75Ω BNC) (Auto reclocking) - SMPTE 424M (3G-SDI) - SMPTE 292M (HD-SDI) - SMPTE 259M (SD-SDI) - DVB-ASI
MFR-16SDOGB	SDI Output Card - BNC x 4 (12G-SDI or 3G-SDI) - BNC x 12 (3G-SDI) Compliant with the following (75Ω BNC) - SMPTE ST 2082-10 (12G-SDI) - SMPTE ST 425-5 (Quad Link 3G-SDI) I/O delay selection Delay (H) (0.3H-1H), 1 frame, 1 frame+ Delay (H)
Monitoring Output	3G/HD/SD-SDI, DVB-ASI: 75Ω BNC x 4 (Auto reclocking not supported)
Audio Input	
MFR-16ADI	AES/EBU Audio Input Card with SRC (Max. 4 cards) - BNC x 16 (16 stereo pairs, 32 channels) - 75 ohm, BNC - Sampling frequency: 32kHz, 44.1kHz, 48kHz, 96kHz
MFR-16AAI	Analog Audio Input Card with A/D converter (Max. 4 cards) - 25-pin D-sub (female) x 4 (16 stereo pairs, 32 channels) - Balanced or unbalanced, 600 ohm or high impedance - Sampling frequency: 48kHz

MFR-16AAIEX	Analog Audio Input Card with A/D converter (Max. 4 cards) - 25-pin D-sub (female) x 4 (16 stereo pairs, 32 channels) - Balanced or unbalanced, 600 ohm or high impedance - Sampling frequency: 48kHz
MFR-16AESI	AES/EBU Audio Input Card (Max. 16 cards) - BNC x 16 (16 stereo pairs, 32 channels) - 75 ohm, BNC
Audio Output	
MFR-16AAOEX	Analog Audio Output Card with D/A converter (Max. 4 cards) - 25-pin D-sub (female) x 4 (16 stereo pairs, 32 channels) - Balanced or unbalanced, less than 100Ω, 48kHz - Sampling frequency: 48kHz
MFR-16ADAO	Embedded/AES/Analog Audio Output Card (Max. 8 cards) AES/EBU (Synchronous only) - BNC x 8 (8 stereo pairs. 16 channels) - 48 kHz Embedded audio (1080/59.94i or 1080/60i) - BNC x 2 (8 stereo pairs. 16 channels), - Unbalanced, 48 kHz Analog audio - 25-pin D-sub (female) x 1 (4 stereo pairs. 8 channels), - Balanced or unbalanced, less than 100Ω, 48 kHz
MFR-16AESO	AES/EBU Audio Output Card (Max. 16 cards) - BNC x 16 (16 stereo pairs. 32 channels) - 75 ohm BNC
RS-422 data input/output	
MFR-16DTIO	RS-422 data Input / Output Card (Max. 8 cards) Data rate: Max. 115.2 kbps 9-pin D-sub (female) x 16
Reference Input	BB: 0.429 Vp-p (NTSC)/0.45 Vp-p (PAL) or Tri-level Sync: ±0.3 Vp-p 75Ω BNC x 2, loop-through (Terminate with 75Ω terminator, it unused.)
Interfaces	
MFR-LAN	10/100/1000 Base-T, RJ-45 x 2 (For connecting up to 128 RU/GPI units.) (Second LAN port used in redundant CPU configuration)
PC-LAN	10/100 Base-TX, RJ-45 x 2 (for PC operation) (Second LAN port used in redundant CPU configuration)
SERIAL	RS-232C/RS-422 (Internal switch), 9-pin D-sub (male) x 1
ALARM	9-pin D-sub (female) x 1 (Input: Reset, Output: Power, Fan Alarm)
Temperature	0ºC to 40ºC
Humidity	30% to 85% (no condensation)
Power	100 VAC to 240 VAC ±10%, 50/60Hz IN x 2
Consumption	256 x 256 input/output, Dual CPU/Redundant Power Unit (Maximum Configuration): 100 V AC to 120 V AC: 630 VA (623 W), 200 V AC to 240 V AC: 638 VA (606 W) * The power consumption may increase up to the following maximum value if performing different signal routing such as video and audio routing. 100 V AC to 120 V AC: 812 VA (816 W), 200 V AC to 240 V AC: 795 VA (817 W)
Dimensions	482 (W) x 710 (H) x 403 (D) mm, EIA 16 RU
Weight	68 kg (with full options)
Consumables	Power supply unit: Replace every 5 years Fans: P-1426, P-1429, P-1430, P-1431, P-1499, P-1500, P-1501, P-1502 Replace every 4 years

8-1-2. MFR-GPI

|	
Number of Connection	Max. 128 (including Main, Remote and GPI units)
Interface	
MFR-LAN	10/100BASE-TX RJ-45 x 1 (Ethernet hub is needed for Main and multiple unit connections.)
SERVICE	RS-232C: 9-pin D-sub (male) x 1 (for maintenance)
GPI IN /TALLY OUT	37-pin D-sub (female) x 4 128-input/output (user assignable)
SERIAL 1-4	RS-232C/422 (selectable): 9-pin D-sub (male) x 4
Temperature	0°C to 40°C
Humidity	30**%** to 85% (no condensation)
Power	+12VDC pin connector x 2 (redundant power supply in standard configuration)
Power Consumption	100 V AC to 120 V AC: 8 VA (4 W) 200 V AC to 240 V AC: 13 VA (6 W)
Dimensions	430(W) x 44(H) x 110(D) mm EIA 1 RU
Weight	2 kg

8-1-3. MFR-TALM

|	
Number of Connections	Max. 128 (including Main, Remote and GPI units)
Interface	
MFR-LAN	10/100/1000BASE-T RJ-45 x 1 (Ethernet hub is required for Main and multiple unit connections.)
PC-LAN	10/100BASE-TX RJ-45 x 1 (for PC or other external devices)
GPI IN /TALLY OUT	37-pin D-sub (female) x 1 32-input/output (user assignable)
RS-422	9-pin D-sub (male) x 4
Temperature	0°C to 40°C
Humidity	30**%** to 85% (no condensation)
Power	+12 V DC pin connector x 2 (redundant power supplies in standard configuration)
Power Consumption	100 V AC to 120 V AC: 17 VA (9 W) 200 V AC to 240 V AC: 20 VA (9 W)
Dimensions	212(W) x 44(H) x 161(D) mm EIA 1 RU half size
Weight	2 kg

8-2. External Dimensions
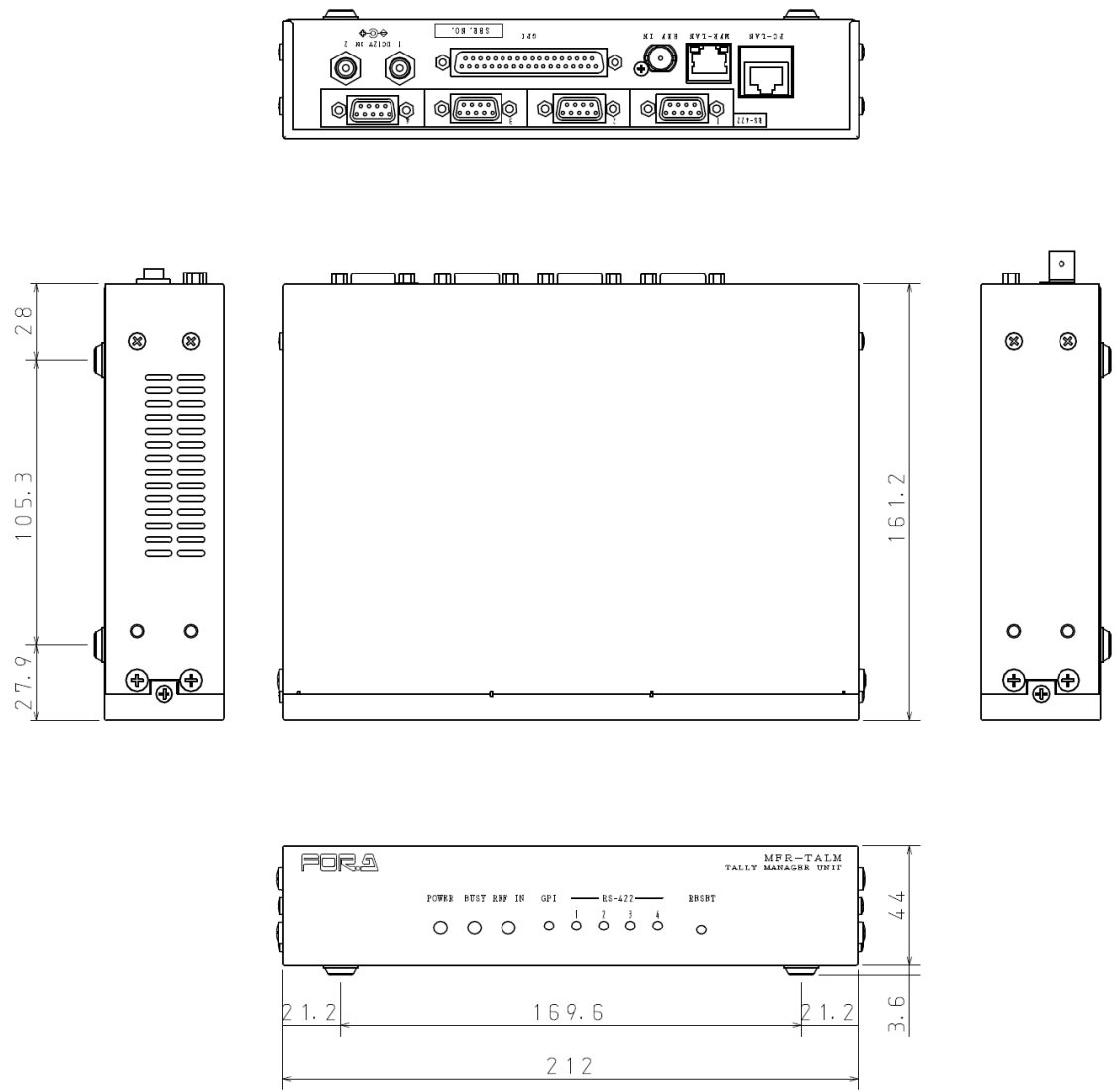
8-2-1. MFR-8000

(All dimensions in mm.)
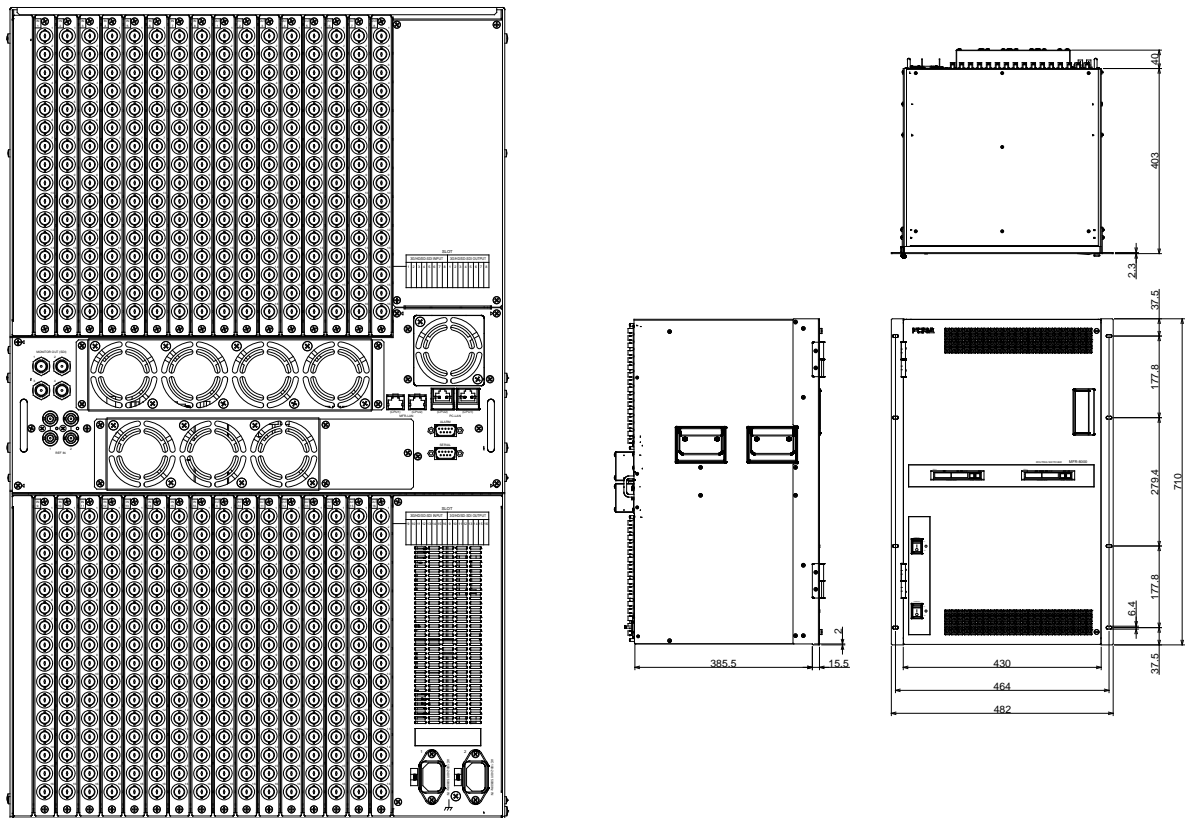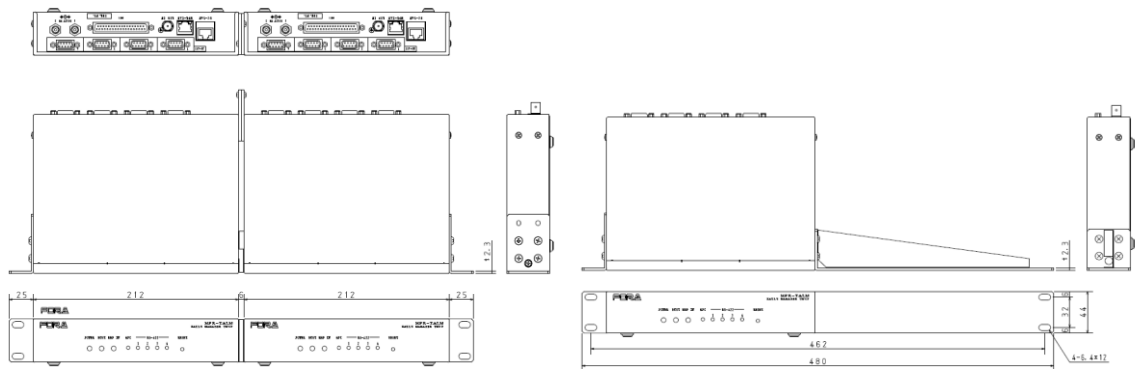

8-2-2. MFR-GPI

(All dimensions in mm.)
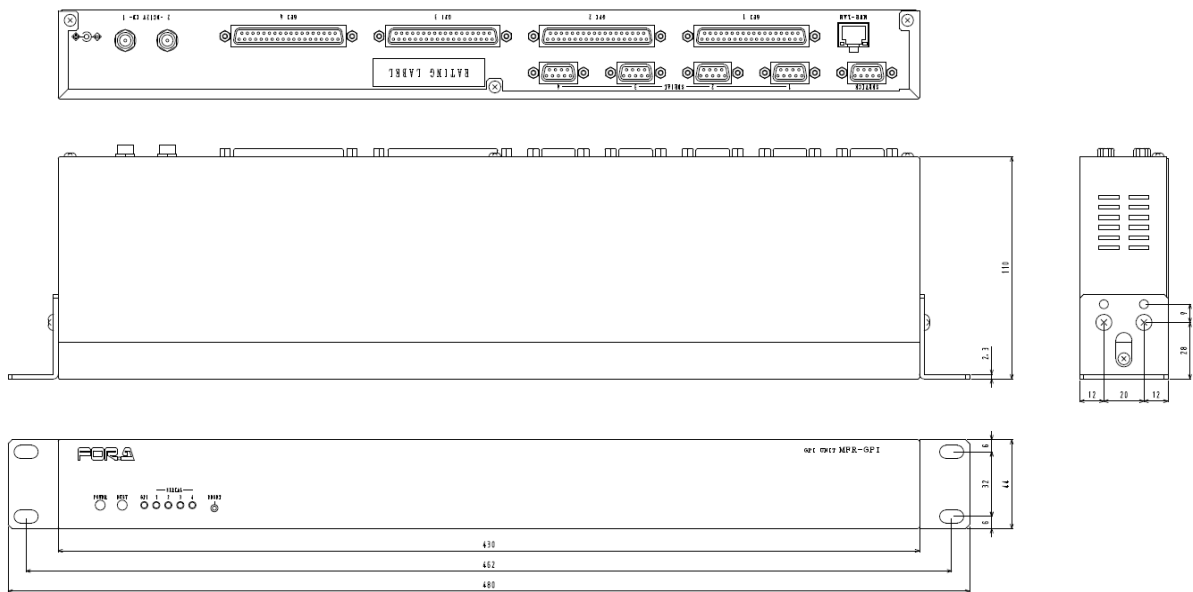
8-2-3. MFR-TALM

(All dimensions in mm.)

◆ **If attaching the rack mount brackets (Dual / Single)**

Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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