OPERATION MANUAL

MFR-4000
Multi Format Routing Switcher

MFR-GPI
MFR-TALM

2nd Edition - Rev. 1

FOR-A COMPANY LIMITED

Edition Revision History

Edit.	Rev.	Date	Description	Section/Page
1	-	2013/08/13	First edition	
2	-	2017/11/29	Support of SNMP Support of MFR-2SDIGB/2SDOGB	Sec. 1-2 Secs. 2-1-1, 2-2, 2-3-5, 2-3-6, 5, 8-1-1
2	1	2018/08/29	Corrected Matrix Size Chart Deleted AC adapters from consumable lists Weight changed	Sec. 2-1-1 Secs. 11-1-3 11-1-4 Sec. 8-1-1

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]

⚠ Hazard	**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

MFR-4000 units and their accessories are fully inspected and adjusted prior to shipment. 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-4000	1	
AC Cord	1 set	AC cable and retaining clip
Rack Mount Brackets	1 set	EIA standard type (Attached to unit.)
CD-ROM	1	Operation manual (PDF)
Quick Setup Guide	1	

◆ **Input / Output Cards**

ITEM	QTY	REMARKS
MFR-9SDI12G	1-8	9 SDI-input card
MFR-9SDO12G	1-8	9 SDI-output card
MFR-8SDIEX	1-8	8 SDI-input card
MFR-8SDOEX	1-8	8 SDI-output card
MFR-2SDIGB	1-8	8 SDI-input card (Gearbox 2ch built-in)
MFR-2SDOGB	1-8	8 SDI-input card (Gearbox 2ch built-in)

* The number of installed cards varies depending on the system configuration. See Sec. 2-1-1. "Matrix Size Chart."

◆ **Option (for MFR-4000)**

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

◆ **Interface Expansion Unit**

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

* Depending on date of production, 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 Cord	1	
Rack Mount Brackets (optional)	1 set	Single- or Dual-unit type EIA standard type

* Depending on date of production, 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-4000 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. Overview

The MFR-4000 is a multi-format routing switcher that supports 12G-SDI, 3G-SDI, HD-SDI, SD-SDI, and ASI signals. Inside the 6U case a matrix of up to 72 inputs/ 72 outputs can be configured. It supports various functions such as the capability of linking multiple units, 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.

1-2. Features

➢ Support for **12G-SDI, 3G-SDI, HD-SDI**, and **ASI** signals with automatic signal recognition that enables operation without concern for the type of signal. Changing the input/output card enables support for **SD-SDI** signals.

➢ 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 switching 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. Real time and smooth switching over to secondary board without down time in case of malfunctions, as well as stable remote control operation supported by **network redundancy**

➢ **Power unit redundancy** for stable power supply against power unit failure or power supply troubles

➢ Main unit front display of settings and alarms enabling the main unit to take over operation in the event a remote environment goes down.

➢ Matrix partition and level setting capabilities support a flexible control environment (maximum of 128 units total including 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 exchange of this data with external devices such as video switchers, multiviewers, etc. The unit performs the task of tally data computation, ordinarily undertaken by the MFR main unit, to accelerate the task.

➢ Allows conversions between 12G-SDI and Quad Link 3G-SDI signals, and between 2SI and SQD, by installing optional **MFR-2SDIGB** and **MFR-2SDOGB** (Gearbox feature built-in) cards.

2. Panel Descriptions

2-1. MFR-4000 Front Panel
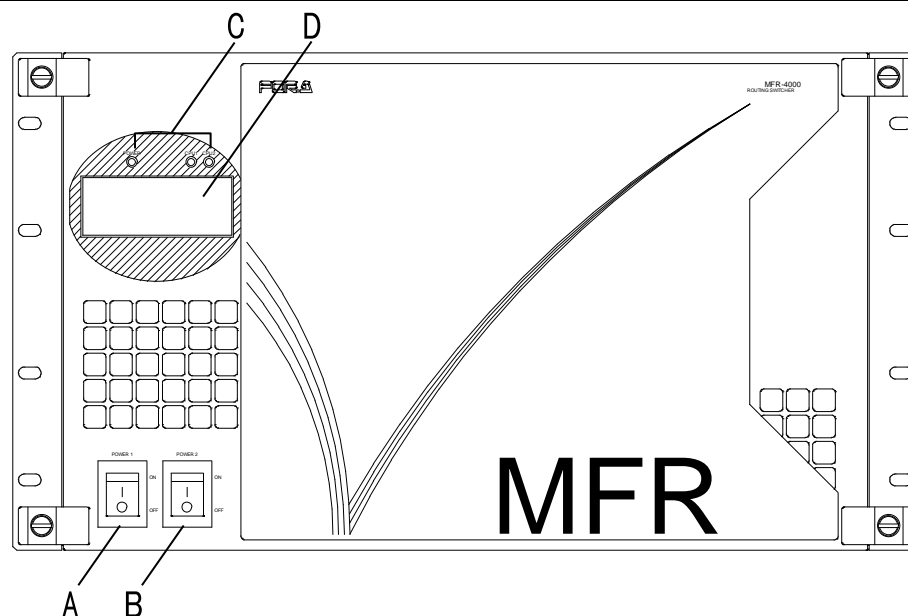
No.	Name		Description	
A	POWER1		Switch used to turn unit power ON / OFF.	
B	POWER2		Switch used to power ON / OFF the optional power supply.	
C	Status Indicators	POWER	Lit green	Power is supplied to the unit.
			Unlit	No power is supplied to the unit. Or power supply unit is not installed.
			Lit red	A failure has occurred. Turn off the power supply unit immediately and consult your reseller.
		CPU1	Lit green	CPU1 card (standard equipment/ Primary CPU) is active.
			Unlit	CPU1 card (standard equipment/ Primary CPU) is inactive.
		CPU2	Lit green	CPU2 card (optional equipment/ Secondary CPU) is active.
			Unlit	CPU2 card (optional equipment/ Secondary CPU) is inactive.
D	Menu Display		Displays menu. See Sec. 4. "Menu Display Operation" for details.	

2-1-1. Matrix Size Chart

◆ **Standard SDI Signal Routing**

Matrix size varies depending on the number of installed MFR-9SDI12G and MFR-9SDO12G cards as shown below. (72 x 72 to 9 x 9)

		Number of cards: MFR-9SDO12G							
		8	7	6	5	4	3	2	1
Number of cards: MFR-9SDI12G	8	72 x 72	72 x 63	72 x 54	72 x 45	72 x 36	72 x 27	72 x 18	72 x 9
	7	63 x 72	63 x 63	63 x 54	63 x 45	63 x 36	63 x 27	63 x 18	63 x 9
	6	54 x 72	54 x 63	54 x 54	54 x 45	54 x 36	54 x 27	54 x 18	54 x 9
	5	45 x 72	45 x 63	45 x 54	45 x 45	45 x 36	45 x 27	45 x 18	45 x 9
	4	36 x 72	36 x 63	36 x 54	36 x 45	36 x 36	36 x 27	36 x 18	36 x 9
	3	27 x 72	27 x 63	27 x 54	27 x 45	27 x 36	27 x 27	27 x 18	27 x 9
	2	18 x 72	18 x 63	18 x 54	18 x 45	18 x 36	18 x 27	18 x 18	18 x 9
	1	9 x 72	9 x 63	9 x 54	9 x 45	9 x 36	9 x 27	9 x 18	9 x 9

Matrix size varies depending on the number of installed MFR-8SDIEX, MFR-8SDOEX, MFR-2SDIGB and MFR-2SDOGB cards as shown below. (64 x 64 to 8 x 8)

		Number of cards: MFR-8SDOEX/MFR-2SDOGB							
		8	7	6	5	4	3	2	1
Number of cards: MFR-8SDIEX /MFR-2SDIGB	8	64 x 64	64 x 56	64 x 48	64 x 40	64 x 32	64 x 24	64 x 16	64 x 8
	7	56 x 64	56 x 56	56 x 48	56 x 40	56 x 32	56 x 24	56 x 16	56 x 8
	6	48 x 64	48 x 56	48 x 48	48 x 40	48 x 32	48 x 24	48 x 16	48 x 8
	5	40 x 64	40 x 56	40 x 48	40 x 40	40 x 32	40 x 24	40 x 16	40 x 8
	4	32 x 64	32 x 56	32 x 48	32 x 40	32 x 32	32 x 24	32 x 16	32 x 8
	3	24 x 64	24 x 56	24 x 48	24 x 40	24 x 32	24 x 24	24 x 16	24 x 8
	2	16 x 64	16 x 56	16 x 48	16 x 40	16 x 32	16 x 24	16 x 16	16 x 8
	1	8 x 64	8 x 56	8 x 48	8 x 40	8 x 32	8 x 24	8 x 16	8 x 8

2-2. MFR-4000 Rear Panel
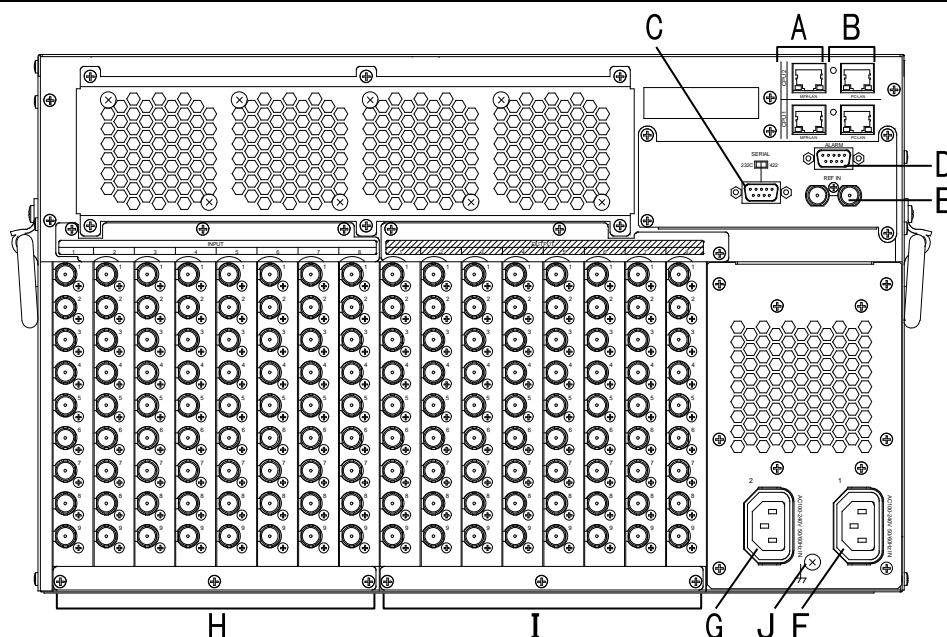
*The above figure shows an MFR-4000 with MFR-9SDI12G and MFR-9SDO12G cards installed.

No.	Name	Description
A	MFR-LAN (CPU1 / CPU2)	Ethernet ports for connection to MFR Remote Control Units and MFR-GPI (10/100BASE-TX, RJ-45)
B	PC-LAN (CPU1 / CPU2)	Ethernet ports for connection to PC or other external unit (10/100/1000BASE-T, RJ-45)
C	SERIAL	Used for control via a serial interface. RS-232C or RS-422 selectable. ► See Sec. 2-2-1. "Interfaces."
D	ALARM	Used for alarm output ► See Sec. 2-2-1. "Interfaces."
E	REF IN1, 2	Used to input reference signals (BB or Tri-level sync signal) (with loop-through. Terminate with 75Ω terminator, if unused.)
F	AC IN1	Used to connect Power Supply Unit 1 (standard equipment) to an AC power source
G	AC IN2	Used to connect Power Supply Unit 2 (optional) to an AC power source
H	INPUT 1-8	MFR-9SDI12G/8SDIEX/2SDIGB: Used to input digital component video signals
I	OUTPUT 1-8	MFR-9SDO12G/8SDOEX/2SDOGB: Used to output digital component video signals
J	Ground Terminal	Used to ground the unit to protect operators against static electricity and/ or electrical shock.

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**
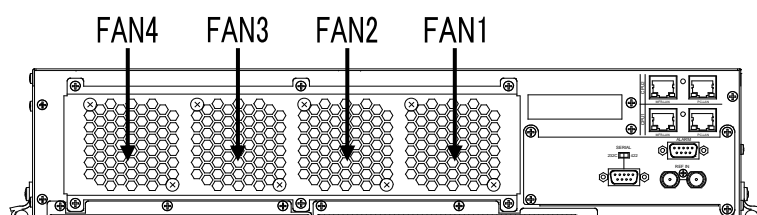
2-2-1. Interfaces

◆ SERIAL Connector (9-pin D-sub, male)
Select RS-232C or RS-422 using the slide switch
on top of the connector.
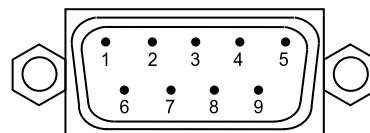
RS-232C Connector Pin Assignments

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 Assignments (Factory default settings)

Pin No.	Signal Name	Description
1	FG	Frame ground
2	T-	Transmit data (-)
3	R+	Receive data (+)
4	SG	Signal Ground
5	NC	Not used
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)**
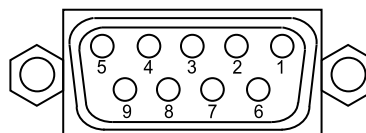
Alarm 1 Out:

Normal operation:	Pins 1 and 6 are open.
Malfunction or power-off:	Pins 1 and 6 are closed.

Alarm 2 Out:

Normal operation:	Pins 2 and 7 are open.
Malfunction or power-off:	Pins 2 and 7 are closed.

ALARM Connector Pin Assignments

Pin No.	Signal Name	Description
1	ALARM1 OUT	Alarm 1 output (Default setting: Fan)
2	ALARM2 OUT	Alarm 2 output (Default setting: Power)
3	NC	Not used
4	NC	Not used
5	NC	Not used
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 ALARM1OUT and ALARM2 OUT. Alarms can be assigned in Web-based Control.

Available alarm signals

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

2-3. SDI Input/Output Cards

2-3-1. MFR-9SDI12G

The MFR-9SDI12G is an SDI input card and can accept 9 total of 12G/3G/HD-SDI and ASI signals.
Up to **8** cards can be installed into **Slot No. 01 to 08**.

► See Sec. 2-1-1. "Matrix Size Chart."
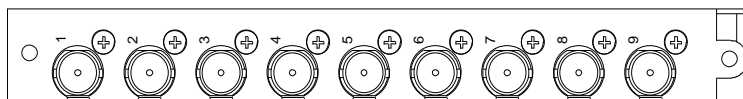
BNC x 9 inputs (12G/3G/HD-SDI or ASI signal auto-detection)

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

◆ Source Name
Open the [Web-based Control: **ROUTER SYSTEM SETTINGS - Source Name** 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-9SDO12G

The MFR-9SDO12G is an SDI output card and can accept 9 total of 12G/3G/HD-SDI and ASI signals.
Up to **8** cards can be installed into **Slot No. 09 to 16**.

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

BNC x 9 outputs (12G/3G/HD-SDI or ASI signal depending on crosspoint selection)

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

◆ 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 or other devices.

◆ 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.

2-3-3. MFR-8SDIEX

The MFR-8SDIEX is an SDI input card and can accept 8 total of 3G/HD/SD-SDI signals.
Up to **8** cards can be installed into **Slot No. 01 to 08**.

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

BNC x 8 inputs (3G/HD/SD-SDI)

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

◆ **Source Name**
Open the [Web-based Control: **ROUTER SYSTEM SETTINGS - Source Name** 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.

2-3-4. MFR-8SDOEX

The MFR-8SDOEX is an SDI output card and can accept 8 total of 3G/HD/SD-SDI signals.
Up to **8** cards can be installed into **Slot No. 09 to 16.**

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

BNC x 8 outputs (3G/HD/SD-SDI signal depending on crosspoint selection)

◆ **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 or other
devices.

◆ **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.

2-3-5. MFR-2SDIGB

The MFR-2SDIGB is a 12G/3G-SDI input card. Its Gearbox function enables conversion between 12G-SDI and Quad Link 3G-SDI signals and conversion between 2SI and SQD signals.

Maximum of 8 cards can be installed into slot Nos.**01-08**.
► See Sec. 2-1-1. "Matrix Size Chart."

The following listed SDI signals can be input.
* 12G-SDI: Max. 2 inputs (BNC 1A, 2A)
* 3G-SDI: Max. 8 inputs
► See Sec. 2-1-1. "Matrix Size Chart."
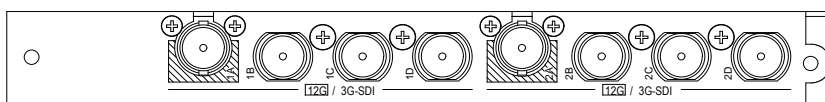
BNC x 8 inputs (12G/3G-SDI)

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

◆   **Gearbox settings**
Open the [Web-based Control: **(Main Unit Settings) – Gearbox Settings** page].
This page allows you to specify input/ output signals to Gearbox, reference signal and delay.

◆   **Source Name**
Open the [Web-based Control: (**Router System Settings) – Source Name** page.].
This page allows you to change displayed source names on Remote Controllers or other devices.

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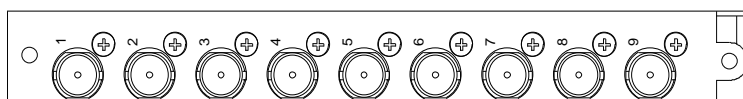Open the [Web-based Control: (**Router System Settings) – Source Assignment** page].
This page allows you to assign physical inputs to logical input channels.

2-3-6. MFR-2SDOGB

The MFR-2SDOGB is a 12G/3G-SDI output card. Its Gearbox function enables conversion between 12G-SDI and Quad Link 3G-SDI signals, and between 2SI and SQD signals.
Max. 8 cards can be installed into slot Nos.**09-16**.
► See Sec. 2-1-1. "Matrix Size Chart."

The following listed SDI signals can be input.
- 12G-SDI: Max. 2 outputs (BNC 1A, 2A)
- 3G-SDI: Max. 8 outputs
► See Sec. 2-1-1. "Matrix Size Chart."
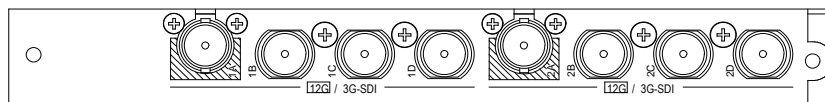
BNC x 8 Outputs (12G/3G-SDI)

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

◆ Gearbox settings
Open the [Web-based Control: **(Main Unit Settings) – Gearbox Settings** page].
This page allows you to specify input/ output signals to Gearbox, reference signal and delay.

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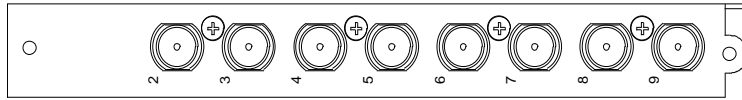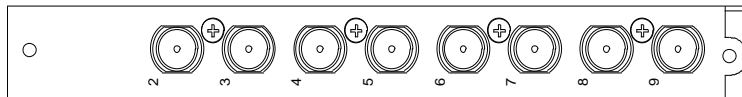
◆ Source Assignment
Open the [Web-based Control: (**Router System Settings) – Destination Assignment** page].
This page allows you to assign physical outputs to logical output channels.

2-4. MFR-GPI

2-4-1. Front Panel
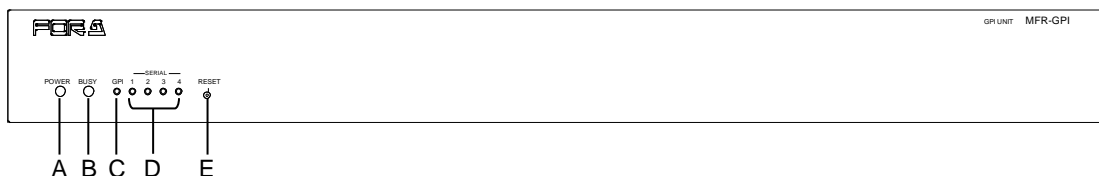
No.	Item	Description
A	POWER	Displays the power status. ► See the table below for details on indications.
B	BUSY	Displays the flash memory writing status of backup settings. ► See the table below for details on indications.
C	GPI	When the GPI function is assigned using Web-based Control, the LED lights green. The LED remains unlit when there is no assignment.
D	SERIAL1 - 4	When a serial port is assigned using 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-GPI 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 memory. (approx. 2 minutes max.)

2-4-2. Rear Panel
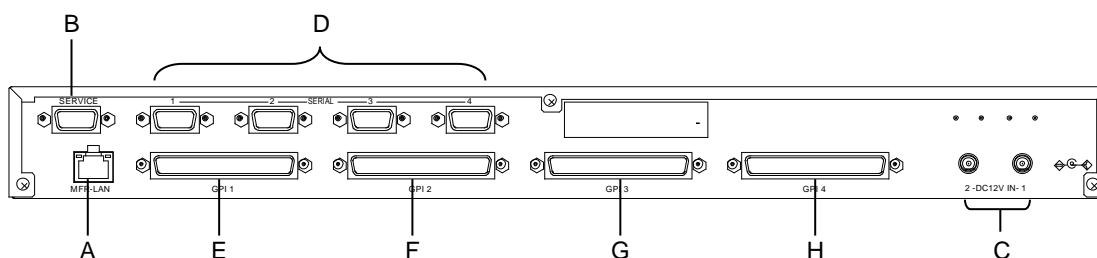
No.	Item	Description
A	MFR-LAN [*1]	Used to connect the MFR main unit Ethernet port (10/100 BASE-TX)
B	SERVICE	Used for maintenance only. Do not use.
C	DC12V IN 1,2	Used to supply 12V DC power.
D	SERIAL1 - 4	Used for serial interface control. The default setting is RS-232C. RS-422 is also selectable using switches on the internal card. ► See Sec. 2-4-4. "Card Switches Pin assignments are the same as those on the MFR main unit. ► See Sec. 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.

2-4-3. Interfaces (MFR-GPI)

◆ **GPI IN / TALLY OUT Connector (37-pin D-sub, female)**
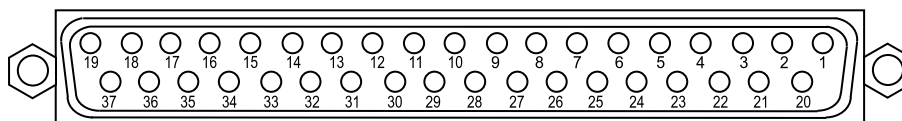
Pin No.	Signal	Pin No.	Signal
1	GPI_IN / TALLY_OUT 01 #	20	GPI_IN / TALLY_OUT 20 #
2	GPI_IN / TALLY_OUT 02 #	21	GPI_IN / TALLY_OUT 21 #
3	GPI_IN / TALLY_OUT 03 #	22	GPI_IN / TALLY_OUT 22 #
4	GPI_IN / TALLY_OUT 04 #	23	GPI_IN / TALLY_OUT 23 #
5	GPI_IN / TALLY_OUT 05 #	24	GPI_IN / TALLY_OUT 24 #
6	GPI_IN / 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**
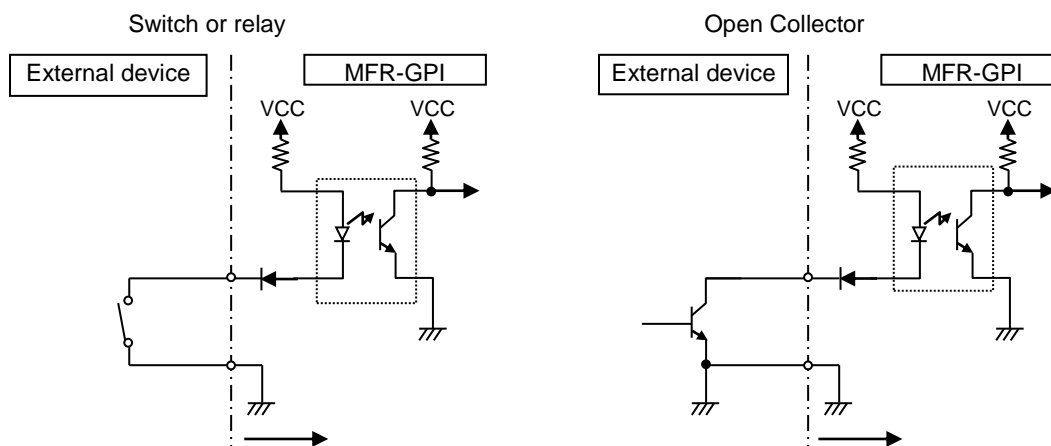
◆ **GPI OUT / TALLY OUT Circuit**

| MFR-GPI | | External device |

Max. voltage: 40V

Max. Current: 100mA

10Ω
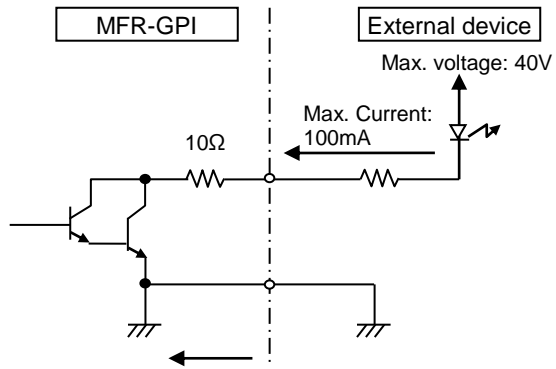
* Approx. 0.9V when turned-on

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2-4-4. Card Switches

⊘ **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.
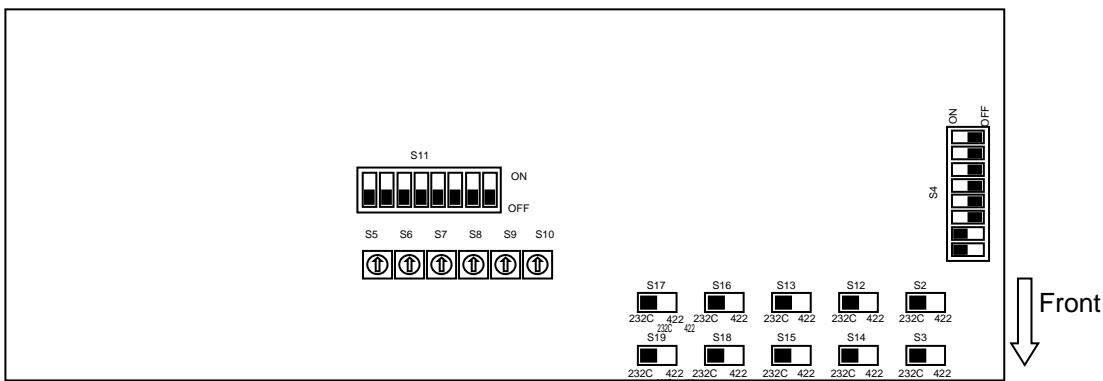
Switch	Function / Settings			
S2,S3	Used for maintenance. Do not use.			
S4	Used for maintenance. Do not use. (Factory default settings are as shown at right. The black boxes (■) represent switches.)	■ switches shown		ON OFF
S5,S6,S7, S8,S9,S10	Used for maintenance. Do not use.	⇑		
S11	Used for maintenance. Do not use.	■ switches shown		ON OFF
S12,S14	Used to select RS-232C/RS-422 for SERIAL 1. The default setting is RS-232C (both switches to the left). To change to RS-422, set both switches to the right.	Switch Settings	RS-232C (Factory default setting)	■ ■
S13,S15	Used to select RS-232C/RS-422 for SERIAL 2. The default setting is RS-232C (both switches to the left). To change to RS-422, set both switches to the right.			
S16,S18	Used to select RS-232C/RS-422 for SERIAL 3. The default setting is RS-232C (both switches to the left). To change to RS-422, set both switches to the right.		RS-422	■ ■
S17,S19	Used to select RS-232C/RS-422 for SERIAL 4. The default setting is RS-232C (both switches to the left). To change to RS-422, set both switches to the right.			

2-5. MFR-TALM

2-5-1. Front Panel
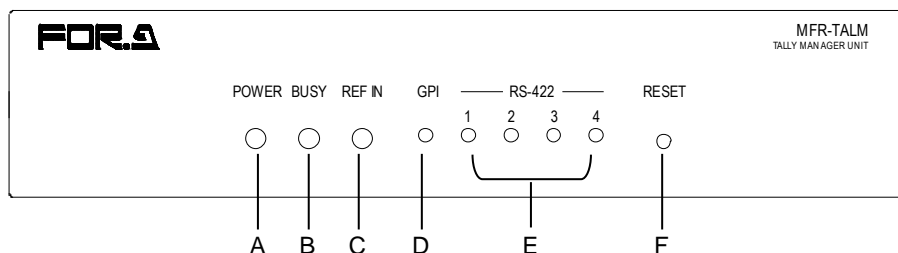
No.	ITEM	Description
A	POWER	Displays power status. ► See the table below for details on indications.
B	BUSY	Displays the flash memory writing status of backup settings. ► See the table below for details on indications.
C	REF IN	Lights green when an external reference signal is present.
D	GPI	Lights green when 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 minutes remain).

2-5-2. Rear Panel
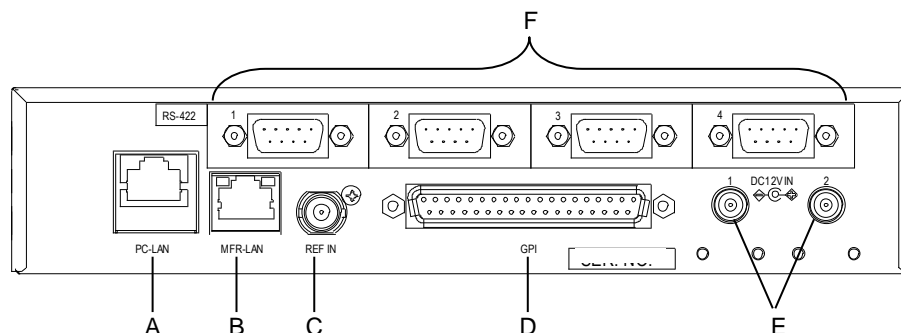
No.	ITEM	Description
A	PC-LAN	Ethernet port for connection to PC or other external unit (10/100BASE-TX, RJ-45)
B	MFR-LAN	Ethernet port for connection to MFR main unit (10/100/1000BASE-T, RJ-45)
C	REF IN	Used to input a reference signal (BB or Tri-level sync signal) (with loop-through. Terminate with 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 Sec. 2-4-3. "Interfaces (MFR-GPI)."
E	DC12V 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 Sec. 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-4000, 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 PC-LAN network segment and other devices. (Default IP addresses (Net mask: 255.255.255.0) are used in the configuration example below.)
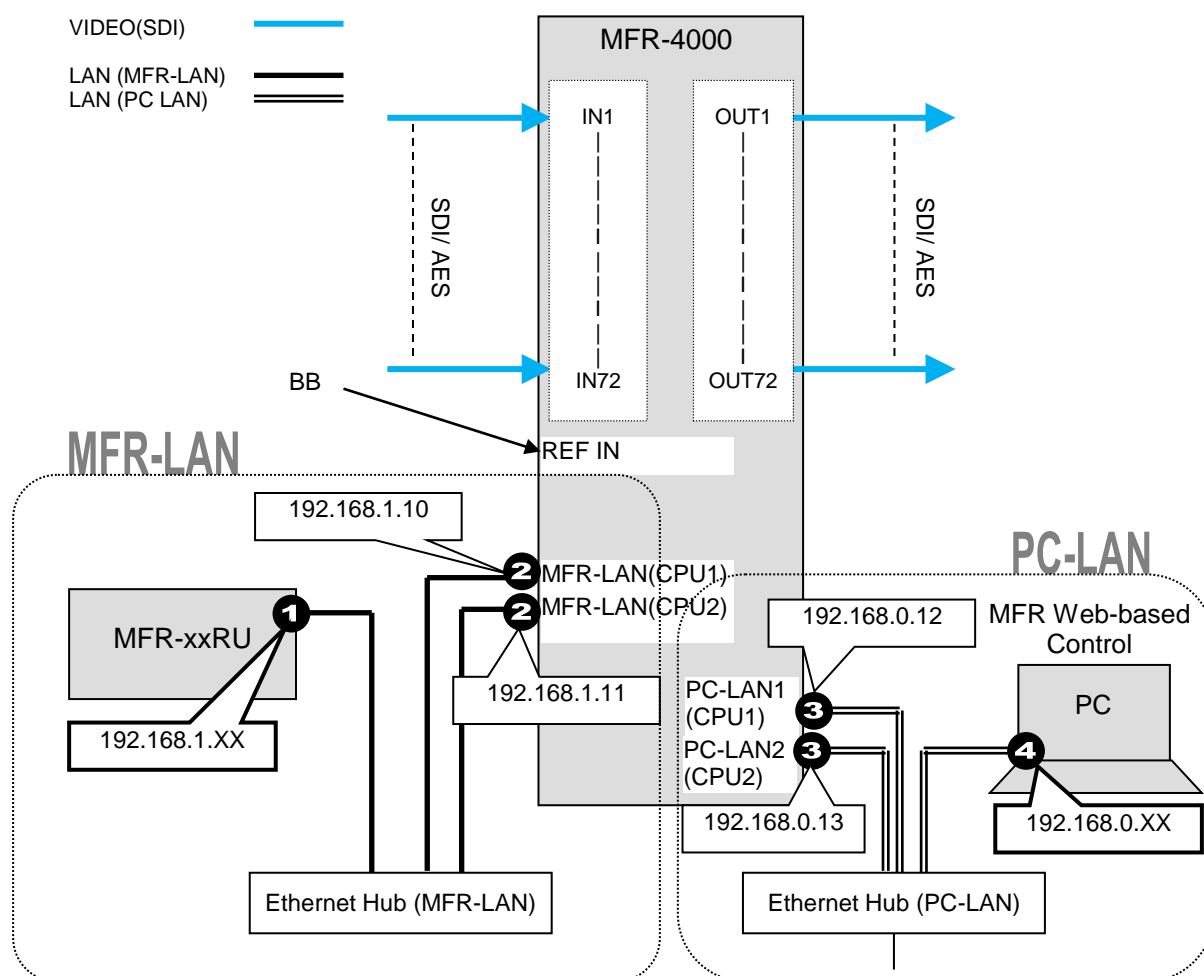
LAN Port Settings

Port	RU Front Panel (Sec. in MFR-RU Series Operation Manual)	Web-based Control
❶	MFR-18RU/18RUA: See Sec. 3-7-2. MFR-39RU: See Sec. 3-4-3. MFR-39RUA: See Sec. 3-4-4. MFR-16RUTA: See Sec. 3-10-2. Other RUs: See Sec. 3-6-2.	[**RU Settings** page]
❷	---	[**MU Settings** page]
❸	MFR-18RU/18RUA: See Sec. 3-7-1. (Display only) MFR-39RU: See Sec. 3-4-3. (Display only) MFR-39RUA: See Sec. 3-4-4. (Display only) MFR-16RUTA: See Sec. 3-10-1. (Display only) Other RUs: See Sec. 3-6-1. (Display only)	[**MU Settings** page]

3-2. 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 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

MFR-4000

MFR-9SDI12G	MFR-9SDO12G
IN1	OUT1
IN72	OUT72

SDI signal

SDI signal

BB → REF IN

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

PC-LAN

MFR-GPI

MFR-16RU

MFR-16RUD

MFR-40RU

MFR-18RU

MFR-39RU

MFR-TALM

REF IN RS-422(1)
RS-422(2)

MFR-LAN PC-LAN

Video Switcher
(HVS-2000)

RS-422(1)
RS-422(4)

SDI → PGM Monitor

SDI → PRV Monitor

Multi Viewer
(MV-4200)

LAN

DVI → MV Monitor

DVI → MV Monitor

DVI → MV Monitor

DVI → MV Monitor

MFR Web Control
MV Layout Editor

PC

Ethernet Hub (MFR-LAN)

Ethernet Hub (PC-LAN)

◆ **Transmitting Signal Name and Tally Data**

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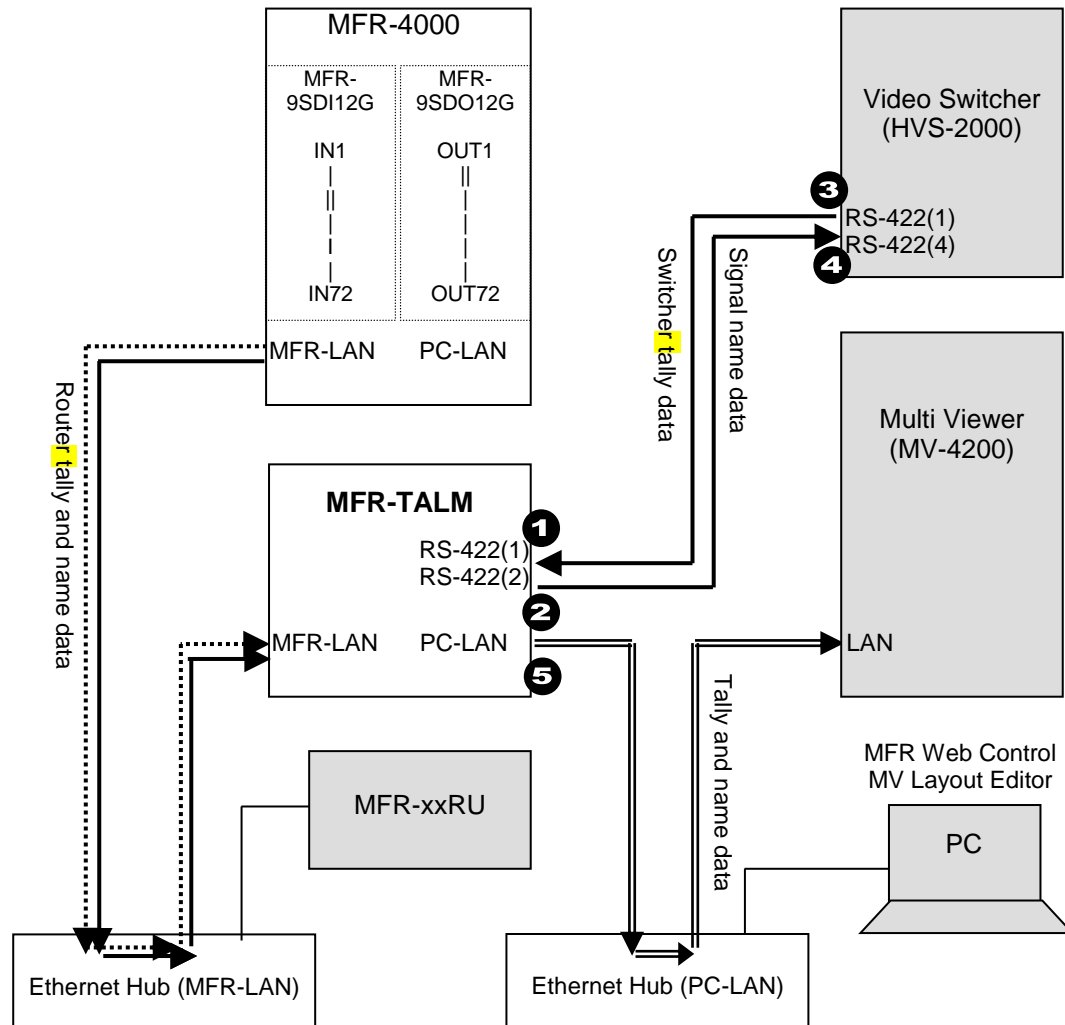
Each serial port should be set as shown in the table below in the relevant page of the **MFR-TALM** Web-based Control accessed from "**http://192.168.1.62**" (default IP address) on your web browser.

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
❺	Web-based Control [TALM Settings]	Client	(MV IP address)	(MV TCP/IP port number)

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

4. Menu Display Operation

After the front panel is removed, you will see menu display selection buttons under the menu display as follows.

STATUS   CANCEL   CONTROL
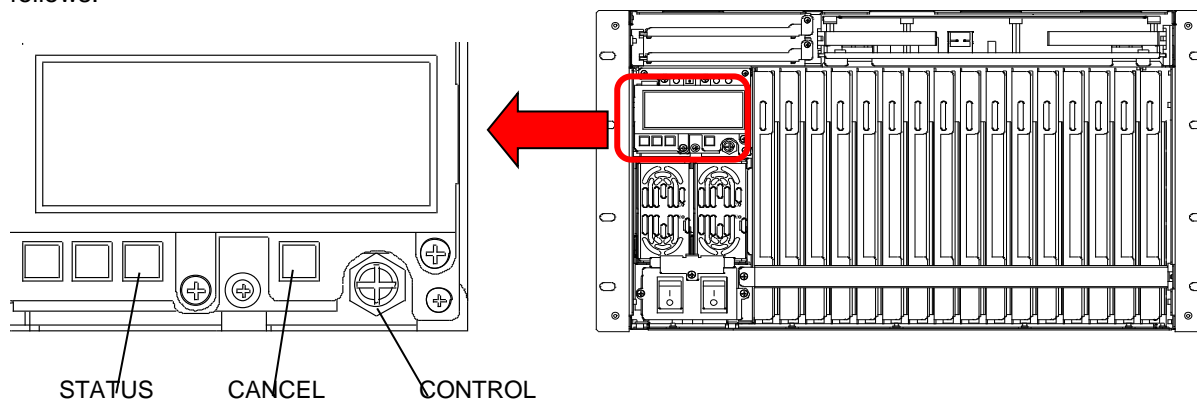
Button	Description
STATUS	Opens **STATUS** menu. (STATUS menu is displayed when button is lit.)
CANCEL	Lit: Displays the menu display. Unlit: Returns to a menu selection using the icons on top.
CONTROL	Moves between menu icons.

Menu display is shown as follows.
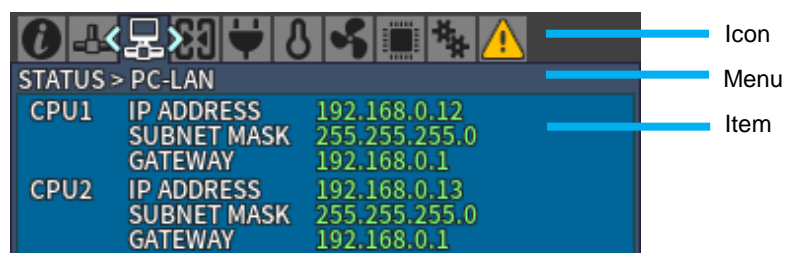
Icon
Menu
Item

Icon	Menu	Description
	[STATUS > INFO]	System Information (See Sec. 4-1-1.)
	[STATUS > MFR-LAN]	MFR-LAN settings (See Sec. 4-1-2.)
	[STATUS > PC-LAN]	PC-LAN settings (See Sec. 4-1-3.)
	[STATUS > SLOT]	Slot status (See Sec. 4-1-4.)
	[STATUS > POWER]	Power status (See Sec. 4-1-5.)
	[STATUS > TEMPERATURE]	Temperature status (See Sec. 4-1-6.)
	[STATUS > FAN]	Fan status (See Sec. 4-1-7.)
	[STATUS > VERSION]	Version information (See Sec. 4-1-8.)
	[SETTING]	Manual switches CPU cards 1 and 2, slot shutdown and whether installed or not of the redundant power supply unit. (See Sec. 4-2.)
	[STATUS > ALARM]	Alarm information (See Sec. 4-1-9.)

4-1. STATUS

Displays various status.
"**Getting...**" is displayed for items acquiring
data.
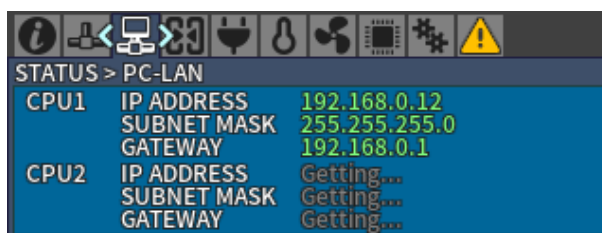
When settings are changed in each menu, the following messages are displayed. (Example below
is [STATUS > INFO] menu.)
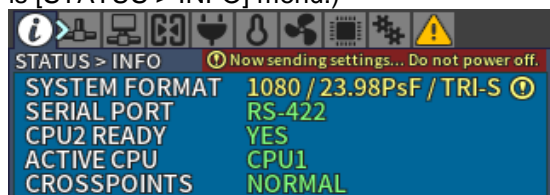
Now sending settings… Do not power off.   Reboot required to apply setting.

4-1-1. STATUS > INFO
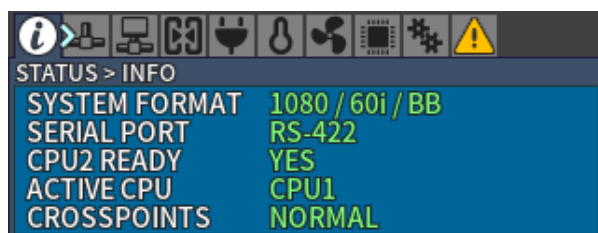
Item	Description
SYSTEM FORMAT	Resolution / Frame rate / Reference
SERIAL PORT	SERIAL port setting on rear panel - **RS-232C** or **RS-422.**
CPU2 READY	CPU2 condition **YES**: Normally operating **NO**: Abnormal operation **NOT INSTALLED**: CPU2 not installed
ACTIVE CPU	Displays an active CPU. **CPU1**: CPU1 is active. **CPU2**: CPU2 is active.
CROSSPOINTS	Displays any crosspoints errors. **NORMAL**: Normally operating **ERROR**: Crosspoint error(s) has occurred.

4-1-2. STATUS > MFR-LAN

Displays MFR-LAN CPU1 and CPU2 IP and Subnet mask addresses.
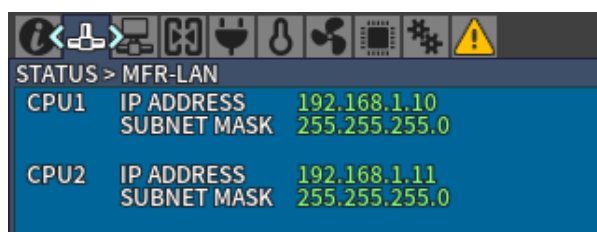
4-1-3. STATUS > PC-LAN

Displays PC-LAN CPU1 and CPU2 IP, Subnet mask and Gateway addresses.
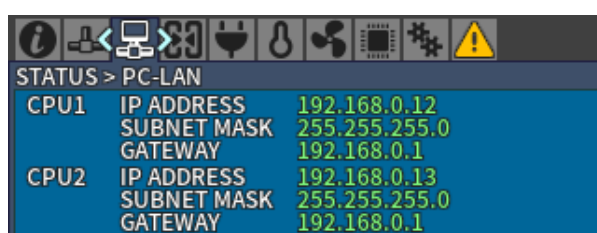
4-1-4. STATUS > SLOT

Move into [STATUS > SLOT] menu where a slot can be selected by pressing CONTROL.
Select a slot by turning CONTROL and push CONTROL to decide a slot to display the installed
card information.
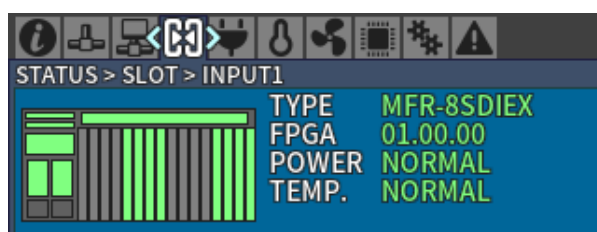
Item	Description
TYPE	Installed card type
FPGA	FPGA version
F/W	Firmware version (When MFR-2SDIGB or MFR-2SDOGB is installed)
POWER	Power supply status NORMAL: Normal. ERROR: Power supply error has occurred.
TEMP.	Temperature status NORMAL: Normal WARNING: Warning ERROR: Abnormal
INACTIVE(SHUTDOWN)	The slot is inactive (shutdown)
NOT INSTALLED	No card is installed into the slot

4-1-5. STATUS > POWER

Displays power supply status for each card and power supply unit.

Item	Description
CPU1	
CPU2	NORMAL: Normal
MATRIX	ERROR: Power supply error occurred.
FRONT	
REAR	
PS1 AC, DC	NORMAL: Normal POWER OFF: Power off
PS2 AC, DC	NORMAL: Normal NOT INST.: Not installed POWER OFF: Power off

4-1-6. STATUS > TEMPERATURE

Displays temperature status of each card and power supply.

Item	Description
CPU1	
CPU2	
MATRIX	NORMAL: Normal
FRONT	WARNING: Warning
REAR	ERROR: Temperature error occurred.
PS1	
PS2	

4-1-7. STATUS > FAN

Status of MFR-4000 rear fan (REAR 1-4) and power supply fan (PS1-2) units.
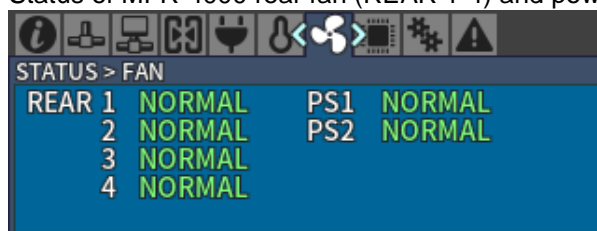
Item	Description
REAR 1-4	NORMAL: Normal
PS1-2	**WARNING**: Warning **ERROR**: Fan unit(s) stopped

4-1-8. STATUS > VERSION

Displays FW (Firmware) , FPGA and CPLD version for each card.

4-1-9. STATUS > ALARM

When an alarm has occurred, ALARM icon is displayed in yellow and the part name indicating an alarm is displayed in red.

Example) Display when a PS2 (Power Supply Unit 2) power supply alarm has occurred.
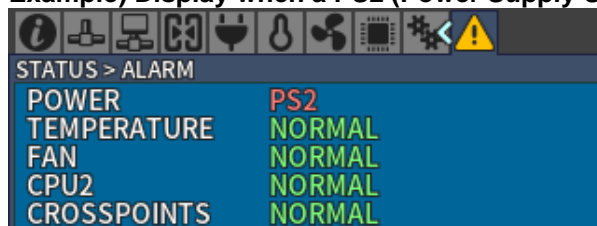
Item	Description
POWER	Displays what power alarm has occurred.
TEMPERATURE	Displays where a temperature alarm has occurred.
FAN	Displays where a fan alarm has occurred.
CPU2	Displays that a CPU2 alarm has occurred.
CROSSPOINTS	Displays crosspoints alarm(s) have occurred.

4-2. SETTING

Turn CONTROL to select a menu to change settings and press CONTROL to enter the settings screen.
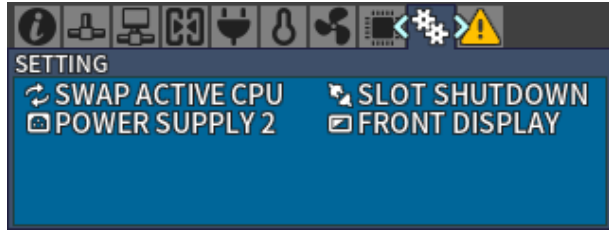
Menu	Description
SWAP ACTIVE CPU	Allows you to manually swap the active CPU.
SLOT SHUTDOWN	Allows you to turn on/off an in/out card.
POWER SUPPLY 2	Allows you to verify power supply 2 installation and change settings.
FRONT DISPLAY	Allows you to change front menu display settings.

4-2-1. Swapping Active CPU

1. Open [SETTING > SWAP ACTIVE CPU] menu. Confirm that **READY FOR SWAP** is set to **YES.**
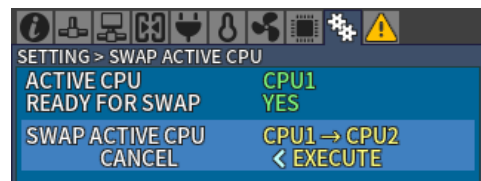
When **READY FOR SWAP** is set to **NO**, a message appears as shown in the right figure.
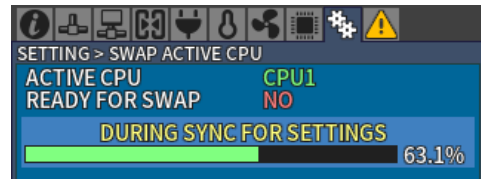
Message	Description
~~THE OTHER CPU IS NOT INSTALLED~~ OTHER CPU NOT INSTALLED	The other CPU to swap is not installed.
~~THE OTHER CPU IS ERROR~~ ERROR IN OTHER CPU	The other CPU to swap is not functioning.
~~DURING SYNC FOR SETTINGS~~ SYNCHRONIZING SETTINGS WITH CPU TO BE SWITCHED	Synchronizing settings with CPU to be switched. Wait until status bar reaches 100%.

2. Turn and press CONTROL to select **EXECUTE** in SWAP ACTIVE CPU. A message **Now Executing…** is displayed while a swap is executed.

4-2-2. Turning ON/OFF an Input/ Output Card

Example) Turning OFF the INPUT1 slot.
1. Open the [SETTING > SLOT SHUTDOWN] menu.
2. Turn and press CONTROL to select **INPUT1** in TARGET SLOT.
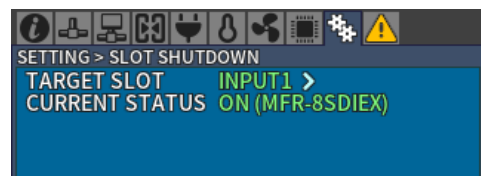
3. Turn and press CONTROL to select **EXECUTE** in CHANGE STATE. A **Now Executing…**message is displayed.
4. When **SHUTDOWN** is displayed, slot shutdown is complete.
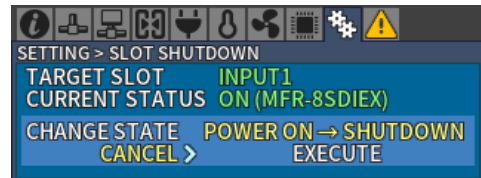
Example) Turning ON the INPUT5 slot.
1. Open [SETTING > SLOT SHUTDOWN] menu.
2. Turn and press CONTROL to select **INPUT5** in TARGET SLOT.
   Confirm that CURRENT STATUS is displayed as **SHUTDOWN**.

3. Turn and press CONTROL to select **EXECUTE** in CHANGE STATE.
   A message **Now Executing…** is displayed.
4. When **ON** is displayed for CURRENT STATUS, turning on slot power is complete.

 NOTE

When **NOT INSTALLED** is displayed for CURRENT STATUS, the slot power is not able to power ON/OFF.

4-2-3. Changing Power Supply 2 Installation Status

Open the [SETTING > POUWER SUPPLY 2] menu to check and change Power Supply 2 installation status.

Whether or not Power Supply 2 is installed can be checked by verifying whether the SETTING > POWER SUPPLY 2 Menu is INSTALLED / NOT INSTALLED
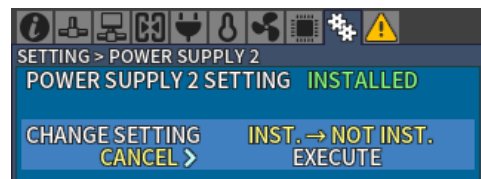
To change Power Supply 2 installation status, turn CONTROL, select EXECUTE in the CHANGE SETTING Menu and press CONTROL.
A message "**Now Executing…**" appears. When the message disappears, the setting is complete.

4-2-4. Changing Menu Display Settings

Open the [SETTING > FRONT DISPLAY] menu to change MFR-4000 menu display settings.
When the menu is not displayed, press the **CANCEL** button to display the menu.
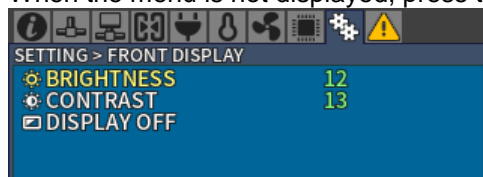
Changing Menu Display Brightness
1. Open the [SETTING > FRONT DISPLAY] menu.
2. Turn and press CONTROL to select **BRIGHTNESS**.
3. Turn and press CONTROL to select the brightness level from 00 (dim) to 15 (bright). (Factory default: **12**)
4. Turn and press CONTROL to select **EXECUTE** under the CHANGE SETTING. If **CANCEL** is selected under the CHANGE SETTING and CONTROL is pressed, the display returns to the [SETTING > FRONT DISPLAY] menu without executing the change.
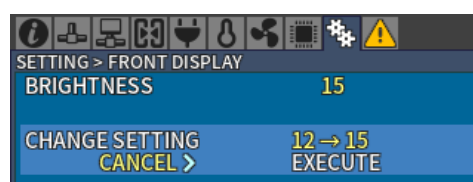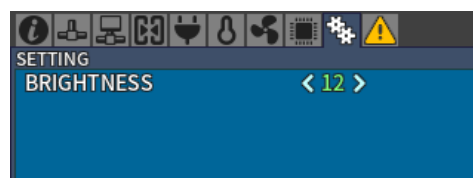
The Menu display contrast can also be adjusted following the above procedure but by selecting **CONTRAST**.
Setting range: 00 (weak) to 15 (strong) (Factory default: **13**)

Hiding Menu Display
1. Open the [SETTING > FRONT DISPLAY] menu.
2. Turn and press CONTROL to select **DISPLAY OFF**.
3. Turn and press CONTROL to select **EXECUTE** under the CHANGE SETTING. Menu Display is hidden. If **CANCEL** is selected under CHANGE

SETTING and CONTROL is pressed, the display returns to the [SETTING > FRONT DISPLAY] menu without executing the change.
4. If the **CANCEL** button is pressed, Menu Display reappears.

*   Menu Display Settings before turning off the power are retained when re-starting the unit.

5. Gearbox Feature (MFR-2SDIGB / 2SDOGB)

Optional **MFR-2SDIGB/2SDOGB** cards support Gearbox features, in which video signal conversion 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.
- AVDL (Automatic Variable Delay Line) clean switching after conversion.
  Also allows Gearbox I/O delay selection. (excluding 2SI / SQD conversion)
- Genlock or Line lock synchronization
- H/V ANC data pass-through

5-1. MFR-2SDIGB / 2SDOGB Cards

MFR-2SDIGB / 2SDOGB cards have two built-in Gearbox units that can respectively perform signal conversions and output test patterns.
Only 1A and 2A connectors can support 12G-SDI signals. If a 12G-SDI signal is input to a Gearbox, B, C and D connectors are disabled.
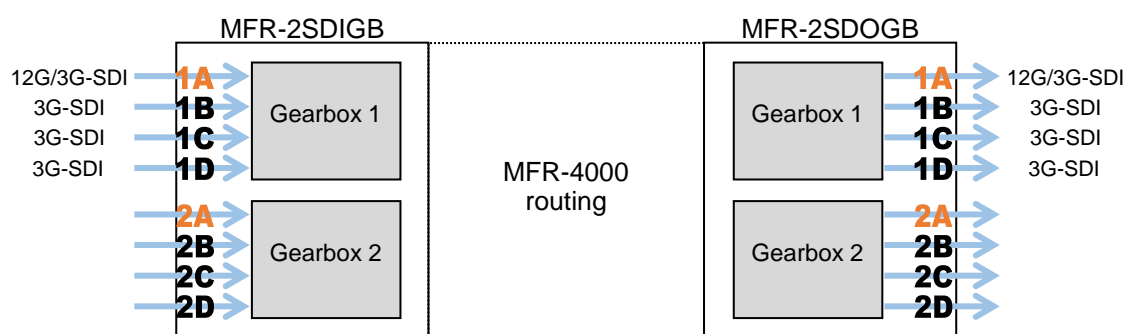
◆ **Supported formats**

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

MFR-2SDIGB / 2SDOGB cards allow following input/output conversions.

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 + Delay (H)	
3G Quad (2SI)	3G Quad (SQD)				
3G Quad (SQD)	3G Quad (2SI)		0.5H to 1H	1 frame + 0H	
3G Quad (2SI)	12G-SDI	Line lock[*1]	0.3H to 1H	0 frame + ** (H)	
		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)	

[*1] SDI signal input to the A connector is used as reference. When Line Lock is selected on MFR-2SDOGB cards, video signals are synchronized by inputting signals to all four channels in Gearboxes.

[*2] Available only on Gearbox 1.

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

[*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, accordingly: **1 frame + 0H** or **1 frame + Delay (H)**.

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)	-0.5H to +0.5H
0.6H	-0.5H to +0.5H	1H (2)	-0.1H to +0.9H
0.7H	-0.4H to +0.6H		

5-3. Conversion Settings

In the WebGUI, specify the Gearbox input and output formats, and then 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-2SDIGB)
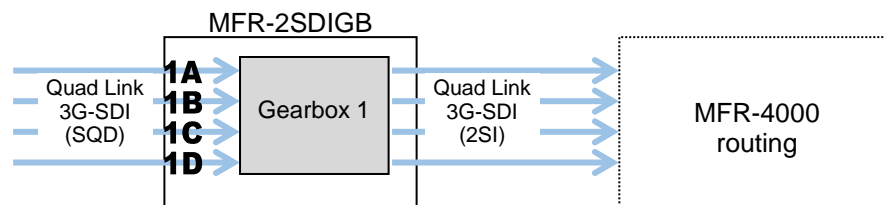
1. Open the **Gearbox Settings** page in the WebGUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-2SDIGB card block. (This example sets Gearbox 1 on the Slot 1 card.)
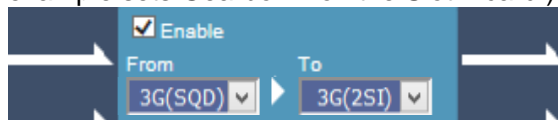
2. Open the **Source Assignment** page in the WebGUI and assign the physical channels (**SDI1-4**) to logical channels (**SRC 1-4**).

	LogicalNo. / Name	Slot	Physical No.
1	SRC 1	1:MFR-2SDIGB	SDI 1
2	SRC 2	1:MFR-2SDIGB	SDI 2
3	SRC 3	1:MFR-2SDIGB	SDI 3
4	SRC 4	1:MFR-2SDIGB	SDI 4

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

5-3-2. Converting 2SI to SQD Output (MFR-2SDOGB)
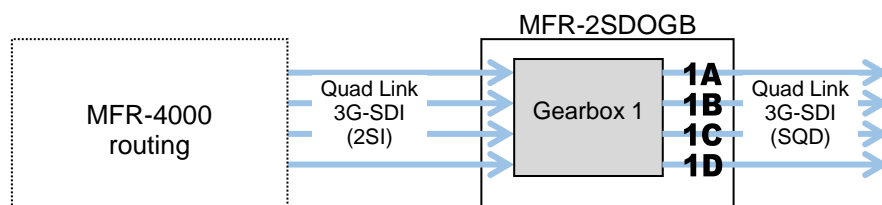
1. Open the **Gearbox Settings** page in the WebGUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-2SDOGB card block. (This example sets Gearbox 1 on the Slot 9 card.)

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-2SDOGB	SDI 1
2	DST 2	1:MFR-2SDOGB	SDI 2
3	DST 3	1:MFR-2SDOGB	SDI 3
4	DST 4	1:MFR-2SDOGB	SDI 4

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

5-3-3. Converting 12G-SDI Input to 3G-SDI 2SI (MFR-2SDIGB)
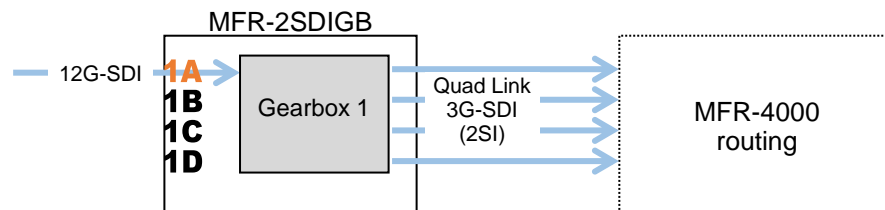
1. Open the **Gearbox Settings** page in the WebGUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-8SDIGB card block. (This example sets Gearbox 1 on the Slot 1 card.)

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

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

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

5-3-4. Converting 3G-SDI SQD to 12G-SDI Output (MFR-2SDOGB)
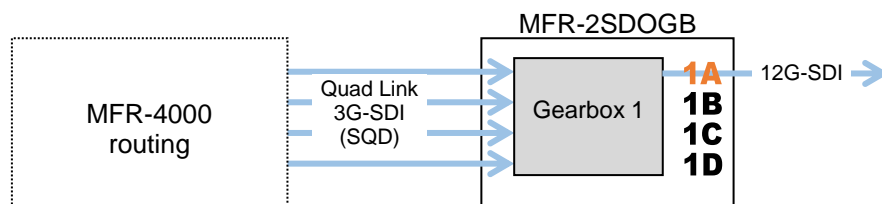
1. Open the **Gearbox Settings** page in the WebGUI and select signal formats under **From** and **To** as shown below for a Gearbox in the MFR-2SDOGB card block. (This example sets Gearbox 1 on the Slot 9 card.)

2. Open the **Destination Assignment** page in the WebGUI and assign the physical channels (**SDI 1 Link A to D**) to logical channels (**DST1-4**).

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

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

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.
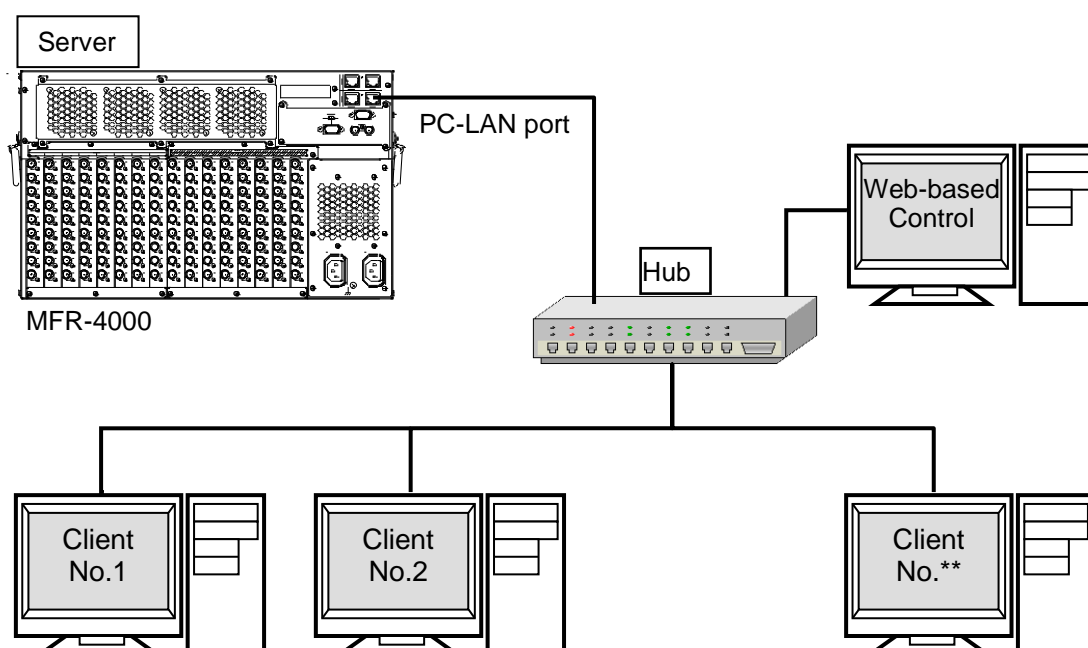
◆ **Basic specifications**

Item	Description
IP address (PC-LAN port)	Primary LAN (PC-LAN CPU1) default IP address: 192.168.0.12 Secondary LAN (PC-LAN CPU2) default IP address: 192.168.0.13* (Subnet Mask: 255.255.255.0)
Port number	Setting range: 49152 to 65534 (default: 23)
Number of PCs	Max. 16
Response / Resend	Wait before sending next command (Resend if the Echo is not returned.)
Login password	None
Communication protocol	TCP/IP, Control PC: Client, MFR-4000: 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	

*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?<SorD><AorK>,<Offset>	K:<SorD><AorK><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

* [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>	000-0FF	Allows you to specify the crosspoint switchover destination.
<Src>	000-0FF	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 (Commands 1-6)

• **Echo and Prompt**
   Responses will be sent as shown below when receiving commands:

Receipt of command ↓ Echo ↓ Prompt	 @[sp]X:<Lvls>/<Dest>,<Src>[CR] [CR][LF]>

* MFR units respond with an Echo Reply with the same data 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" or "Prompt"

• **"C" responses**
   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 terminals in the system.

Parameter	Setting range	Description
<Salvo number >	1-FFF	The number of crosspoints 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 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**
  An "S" response is sent as shown below when crosspoints are switched by a command.

  [CR][LF]S:<Lvl><Dest>,<Src>[CR][LF]

* If a crosspoint is switched by an X or B command, its "S" response is sent to all 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.
* When 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 from changing.

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

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]>	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
(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]		

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

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

- **Timeout Period for Response Commands 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 the next command to be sent when receiving a prompt.
Resends the previous command when the timeout period (5 seconds) has elapsed without reply after sending a command.

Ex. 2)
Allows the next command to be sent when receiving a prompt.
Resends the previous command when the timeout period (5 seconds) has elapsed without reply after sending a command.
Recognizes and uses "S" responses as tallies (crosspoint states).

Ex. 3)
Allows the next command to be sent when receiving a prompt.
Recognizes and uses "S" responses as tallies (crosspoint states).
Resends the previous command when the timeout period (5 seconds) has elapsed without reply after sending a command.
Sets the maximum number of continuous resends, because crosspoints cannot be changed if they are locked or inhibited from changing.

Ex. 4)
Allows the next command to be sent when receiving a prompt.
Resends the previous command when the timeout period (5 seconds) has elapsed without reply (echo) after sending a command.

Ex. 5)
Allows the next command to be sent when receiving a prompt if tally or echo recognition is not performed.

- **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 line buffer	
Processing S Response	Does the line buffer begin with **S:**?
	- Other characters are recognized and used as tallies.
	- Characters are cleared, if unnecessary.
Processing C Response	Does the line buffer begin with **C:**?
	- Other characters are received as 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 Overlap:**

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 returned to all these terminals from the MFR.

The following command examples show 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

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

Message examples returned to Terminal 2

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

* 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:<SorD><AorK><No.>,<Dat>

Commands

BYTE No.	1	2	3	4	5	6	7	8-10	11
Command	@	[sp]	K	?	S	A	,	000-0FF	CR
					D	K			

Command response

BYTE No.	1	2	3	4	5	6	7-9	10	11-		
Response	CR	LF	K	:	S	A	000-0FF	,		CR	LF
					D	K					

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.
Response	BYTE7-9	<No.> Indicates the channel number.
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 Response	CR	Carriage return
	LF	Line feed

Up to 32 channel names can be obtained per request.

Note that if 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	0	1

K:	D	K	065,	E587BA	E58A9B	EFBC91	EFBC90	EFBC92
	Destination	Kanji	Channel 102	出	力	1	0	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 65	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-4000.

◆ **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**

Two response types indicate whether the CPU is active or passive state.
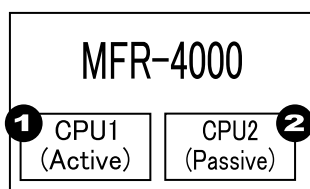
If the CPU is active:

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 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
@[sp]K:<S or D><S or L or A><No>,<Dat>	Echo Prompt

Commands

BYTE No.	1	2	3	4	5	6	7-9	10	11-	
Command	@	[sp]	K	:	S	S	000-0FF	,		CR
					D	L				
						A				

BYTE 5	<S or D> Select between S (Source) or D (Destination)
BYTE 6	<S or L or A > Select the destination to which names are imported. S: Source Name or Destination Name, ID Name (Kanji) fields on the WebGUI. L: Source Name or Destination Name, Import Name fields on the WebGUI. A: Source Name or Destination Name, Name (ASCII) fields on the WebGUI.
BYTE 7-9	<No.> Indicates the channel number.
BYTE 11-	<Dat> Indicates the channel names Strings in Hex characters (max. 128 bytes). Character code: UTF-8
CR	Carriage return

7. Troubleshooting

If any of the following problems occur while operating your MFR-4000, 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 doing so 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?	Properly connect cables.
	Are I/O cards installed into correct slots?	Re-install the I/O cards into their correct slots.
	Are the crosspoints set properly?	Set crosspoints properly.
Unable to control using the remote control panel.	Is the LAN cable properly connected?	Properly connect the LAN cable.
	Does the RU Info page in the Web-based Control indicate NG?	Check the item/s 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.)	Ensure both MFR-LAN (CPU1) and MFR-LAN (CPU2) are connected properly to the network.
	If network connections are properly made, turn the MFR-4000 power OFF then ON again.	Consult your FOR-A agent if the secondary CPU is still active after restarting

8. Specifications and Dimensions

8-1. Unit Specifications

8-1-1. MFR-4000

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. 9 x 9 to Max. 72 x 72 (Expandable on a 9-channel basis) Number of input slots: 8 Number of output slots: 8
Video Input		
	MFR-9SDI12G	SDI Input Card: 75 ohm, BNC x 9 (8 cards Max.) Complies with the following standards (75Ω BNC) - SMPTE ST 2082-10 (12G-SDI) - SMPTE 424M (3G-SDI) - SMPTE 292M (HD-SDI) - DVB-ASI Cable Equalization 12G-SDI: 100 m (L-5.5CUHD cable) 3G/HD-SDI: 100 m (5C-FB cable)
	MFR-8SDIEX	SDI Input Card: 75 ohm, BNC x 8 (8 cards Max.) Complies with the following standards (75Ω BNC) - SMPTE 424M (2.97 Gbps, 2.97/1.001 Gbps) - SMPTE 292M (1.485 Gbps, 1.485/1.001 Gbps) - SMPTE 259M (270 Mbps) - DVB-ASI Cable Equalization 3G/HD-SDI: 100 m (5C-FB cable) SD-SDI: 200 m (5C-2V cable)
	MFR-2SDIGB	SDI Input Card ·BNC x 2 (12G-SDI or 3G-SDI) ·BNC x 6 (3G-SDI) Complies with the following standards (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-9SDO12G	SDI Output Card: 75 ohm, BNC x 9 (8 cards Max.) Complies with the following standards (75Ω BNC) (Auto reclocking) - SMPTE ST 2082-10 (12G-SDI) - SMPTE 424M (3G-SDI) - SMPTE 292M (HD-SDI) - DVB-ASI Cable Equalization 12G-SDI: 100m (L-5.5CUHD cable) 3G/HD-SDI: 100m (5C-FB cable)

MFR-8SDOEX	SDI Output Card: 75 ohm, BNC x 8 (8 cards Max.) Complies with the following standards (75Ω BNC) (Auto reclocking) - SMPTE 424M (2.97 Gbps, 2.97/1.001 Gbps) - SMPTE 292M (1.485 Gbps, 1.485/1.001 Gbps) - SMPTE 259M (270 Mbps) - DVB-ASI Cable Equalization 3G/HD-SDI: 100m (5C-FB cable) SD-SDI: 200m (5C-2V cable)
MFR-2SDOGB	SDI Output Card ·BNC x 2 (12G-SDI or 3G-SDI) ·BNC x 6 (3G-SDI) Complies with the following standards (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)
Reference Input	BB: 0.429 Vp-p (NTSC)/0.45 Vp-p (PAL) or Tri-level Sync: 0.6 Vp-p 75Ω BNC x 2, loop-through (Terminate with 75Ω terminator, it unused.)
Interfaces	
MFR-LAN	10/100 BASE-TX, RJ-45 x 2 (For connecting up to 128 RU/GPI units.) (Second LAN port used in redundant CPU configuration)
PC-LAN	10/100/1000 BASE-T, 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 9 (female) x1 (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	SDI 72 x 72, Dual CPU/Redundant Power Unit (Maximum Configuration) 100 V AC to 120 V AC: 650 VA (611 W) 220 V AC to 240 V AC: 660 VA (501 W)
Dimensions	482 (W) x 265 (H) x 400 (D) mm, EIA 6 RU
Weight	35 kg (Including all options)
Consumables	Power supply unit: Replace every 5 years Fans P-1578, P-1579, P-1580 and P-1581: Replace every 4 years.

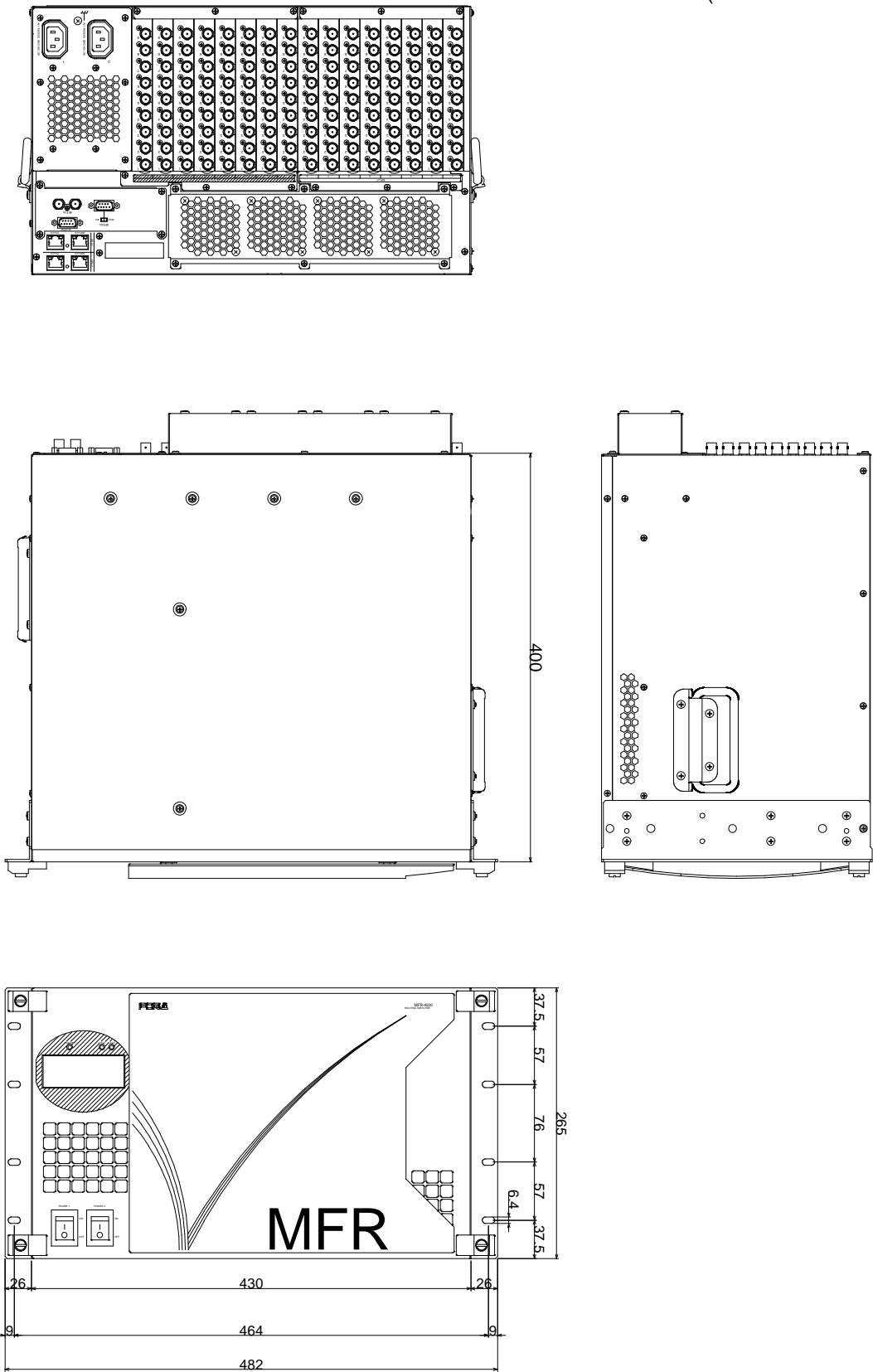## 8-1-2. MFR-GPI

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	37-pin D-sub (female) x 4
/TALLY OUT	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 as standard)
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
Consumables	AC adaptor: Replace every 5 years

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	37-pin D-sub (female) x 1
/TALLY OUT	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 as standard)
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 Rack
Weight	2 kg
Consumables	AC adaptor: Replace every 5 years

8-2. External Dimensions

8-2-1. MFR-4000
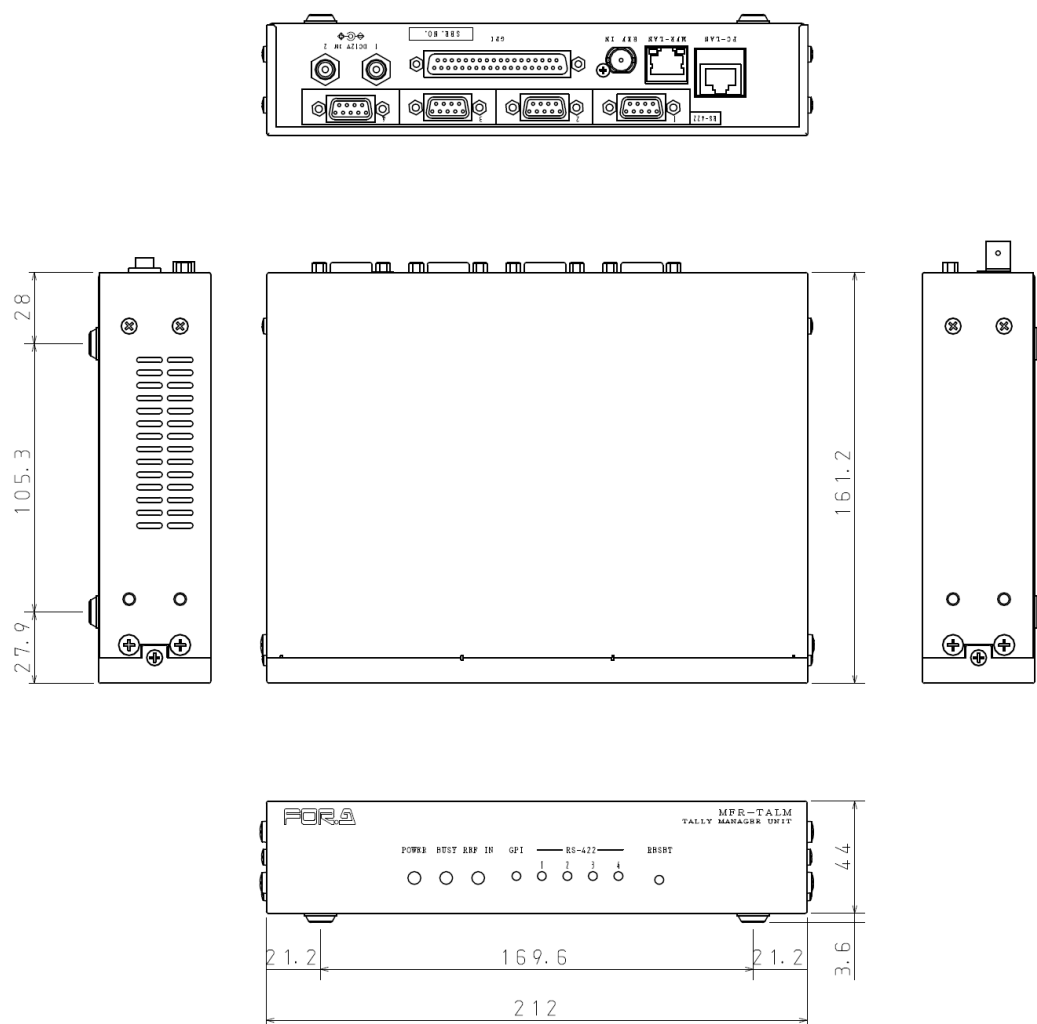
(All dimensions in mm.)

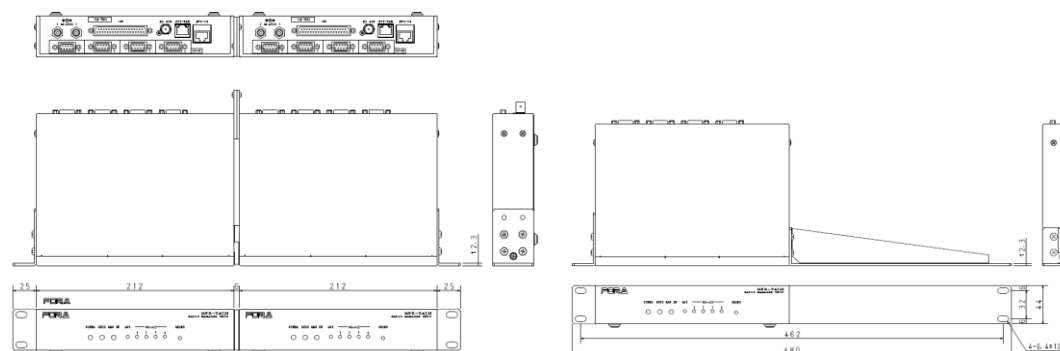## 8-2-2. MFR-GPI

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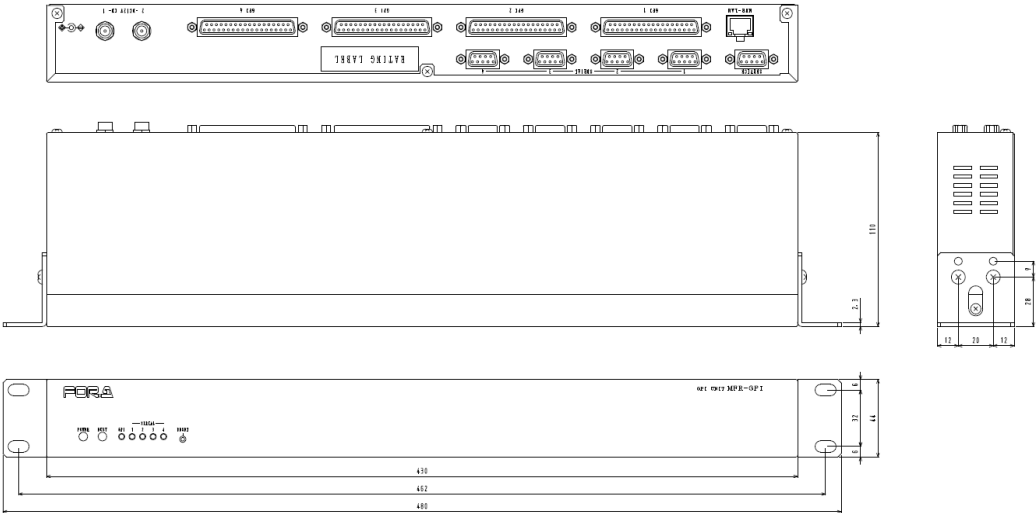
8-2-3. MFR-TALM

(All dimensions in mm.)

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

# Appendix 1. I/ O Card Installation / Replacement

IMPORTANT

Contact FOR-A agent or service center for I/O Card installation and replacement work since such work should only be conducted by qualified technical personnel.
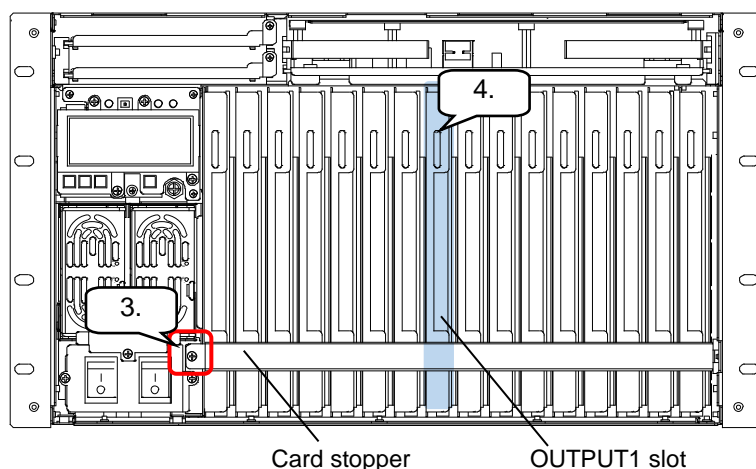
1-1. How to Install a New Card

The following procedure shows how to install an output card into OUTPUT1 slot.

1. Unfasten to remove four fixing screws along the front panel as shown and detach the front panel.
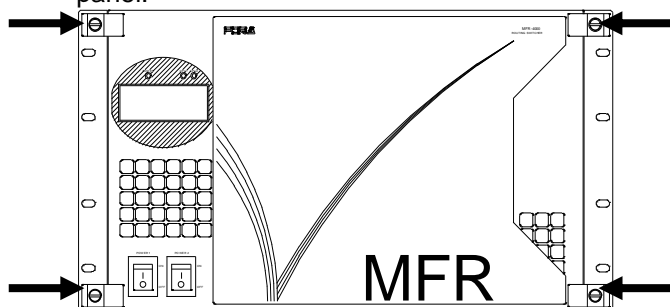
2. Remove the screw on the left side of the card stopper (circled in red) and detach the stopper.
3. Detach the OUTPUT1 slot blank panel.

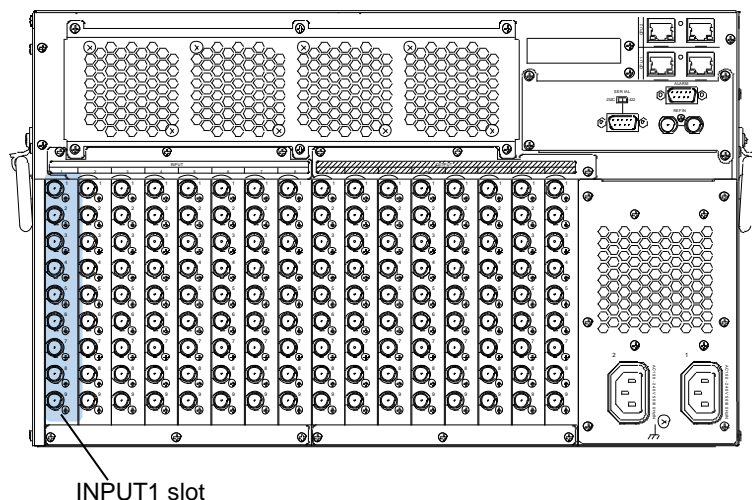Card stopper   OUTPUT1 slot

4. Insert a new card firmly into the OUTPUT1 slot.
    *   Confirm the slot number and direction before card insertion.
5. Re-install the card stopper removed in Step 2
6. Turn the OUTPUT1 slot ON using [SETTING > SLOT SHUTDOWN] menu in Menu display. See Sec. 4-2-2. "Turning ON/OFF an Input/ Output Card" for details.
7. Verify that LEDs on the card installed into OUTPUT1 light up.
8. Re-install the front panel.

A new card installation is now complete.

1-2. How to Replace a Card

The following procedure shows how to replace a card in INPUT1 to a new input card.

1. Detach all the BNC cables connected to the INPUT1 connector ports.

INPUT1 slot

2. Unfasten to remove four fixing screws along the front panel and detach the front panel.
3. Shutdown the INPUT1 slot in [SETTING > SLOT SHUTDOWN] menu of Menu Display. See Sec. 4-2-2. "Turning ON/OFF an Input/ Output Card" for details.
4. Remove the screw on the left side of the card stopper and detach the stopper.
5. Grab the INPUT1 slot card handle and slowly remove (pull out) the card.

Card stopper   INPUT1 slot
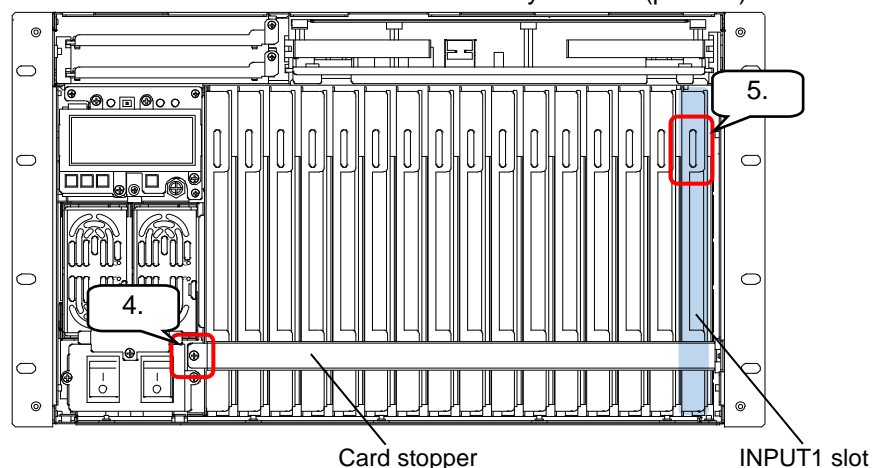
6. Insert a new card firmly into the INPUT1 slot.
*   Confirm the slot number and direction before card insertion.
7. Re-install the card stopper removed in Step 4.
8. Turn the INPUT1 slot ON using [SETTING > SLOT SHUTDOWN] menu in Menu display. See Sec. 4-2-2. "Turning ON/OFF an Input/ Output Card" for details.
9. Verify that LEDs on the card installed into INPUT1 light up.
10. Re-install the front panel.

The card replacement is now complete.

Appendix 2. Installation/ Replacement of MFR-CPUA (Option)
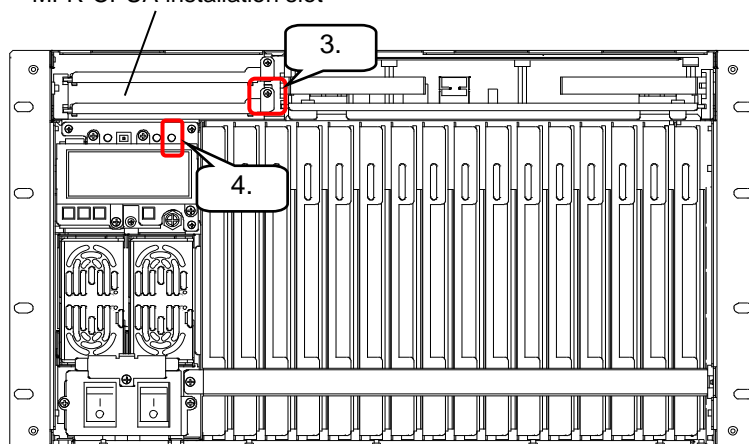
2-1. How to Install a New MFR-CPUA

IMPORTANT

Do not touch any components on the MFR-CPUA to protect it from electrostatic damage.
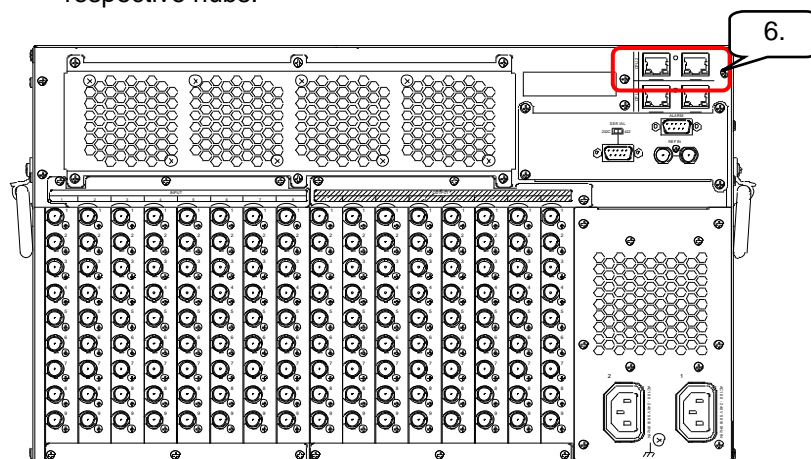
The following procedure shows how to install a new MFR-CPUA card.

1. Unfasten to remove four fixing screws along the front panel and detach the front panel.
2. Insert a new MFR-CPUA firmly into its slot as shown below.
3. Fasten the fixing screw on the right side (circled in red) of the MFR-CPUA.
4. Verify that the LED on the CPU2 is unlit.

MFR-CPUA installation slot

5. Re-install the front panel.
6 Insert LAN cables into CPU2 MFR-LAN and PC-LAN ports and connect the cables with respective hubs.
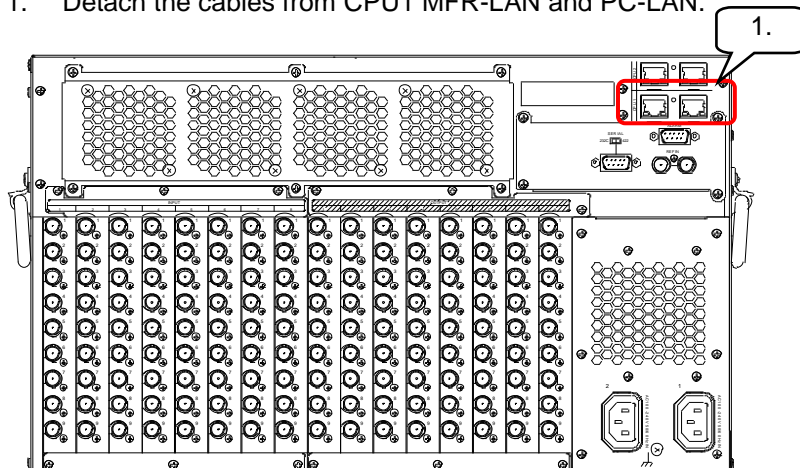

MFR-CPUA installation is now complete.

2-2. How to Replace a CPU1 Card

IMPORTANT

Do not touch the components on the MFR-CPU to protect it from electrostatic damage.

The following procedure shows how to replace an MFR-CPU card.

1. Detach the cables from CPU1 MFR-LAN and PC-LAN.

2. Unfasten to remove four fixing screws along the front panel and detach the front panel.
3. Unfasten the fixing screw of CPU1.
4. Grab the CPU1 card handle and slowly remove (pull out) the card.
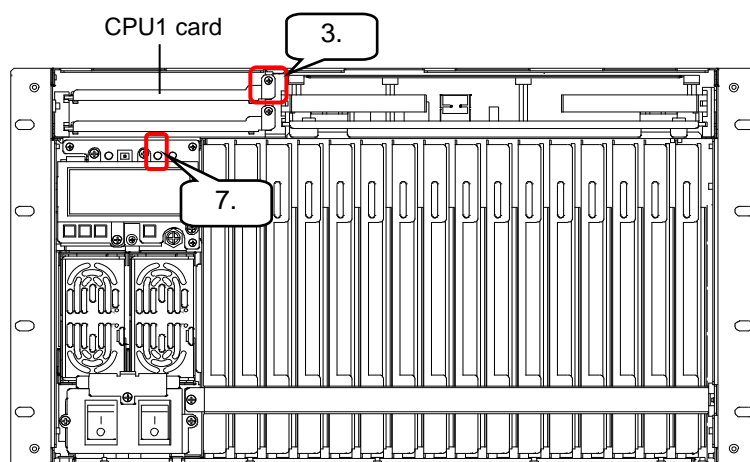
5. Insert a new MFR-CPUA card firmly into the slot.
6. Fasten the fixing screw on the right side of the card.
7. Verify that the LED on the CPU1 is unlit.
8. Re-install the front panel.
9. Re-connect LAN cables detached in Step 1. into the CPU1 MFR-LAN and PC-LAN connection ports.

CPU1 replacement is now complete.

Appendix 3. Installation/ Replacement of
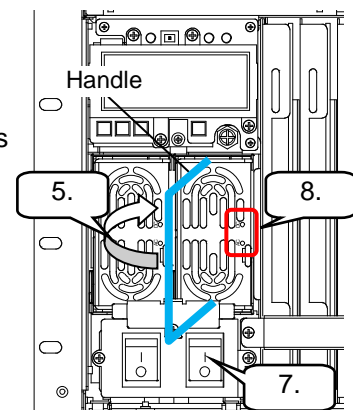## MFR-PSA (Option)

3-1. How to Install a New MFR-PSA

The following procedure shows how to install a new MFR-PSA.

1. Unfasten to remove four fixing screws along the front panel and detach the front panel.

The slot to install an MFR-PSA

2. Turn off the POWER2 power supply switch.
3. Remove the screw and detach the power supply unit fixing plate.
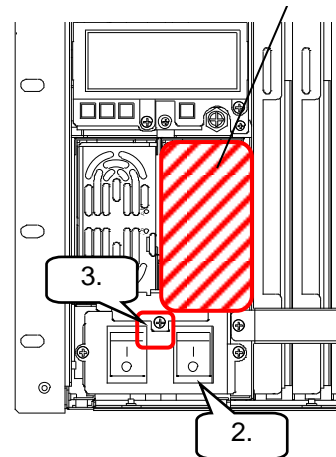
4. Confirm that the MFR-PSA is facing correct direction and firmly insert the unit.

5. Lay down the MFR-PSA handle.
6. Re-install the plate and screw detached in Step 3.
7. Turn on the POWER2 power supply switch.
8. Verify that the AC and DC LEDs on the MFR-PSA lights green.
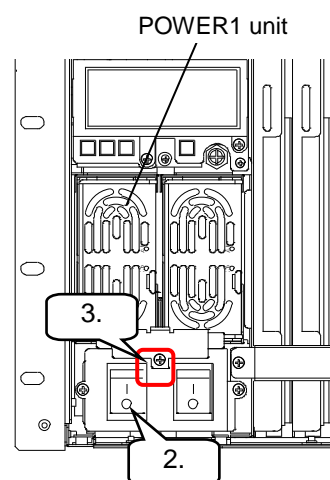9. Re-install the front panel.

MFR-PSA installation is now complete.
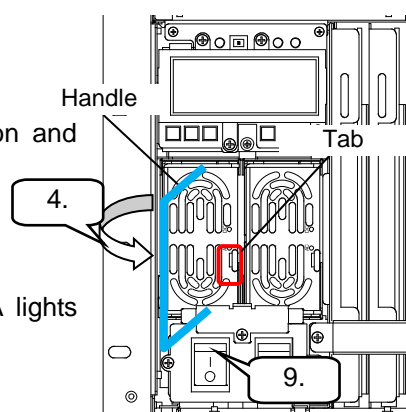
Handle

3-2. How to Replace an MFR-PSA

The following procedure shows how to replace an MFR-PSA.

1. Unfasten to remove four fixing screws along the front panel and detach the front panel.

2. Turn off the POWER1 power supply switch.
3. Remove the screw and detach the power supply unit fixing plate.

POWER1 unit

3.

2.

4. Stand the MFR-PSA handle upright.
5. Grab the handle to pull out the POWER1 unit while pushing the light-blue tab to the left (as shown).
6. Confirm that the MFR-PSA is facing correct direction and firmly insert the unit.
7. Lay down the MFR-PSA handle.
8. Re-install the plate and screw detached in Step 3.
9. Turn on the POWER1 power supply switch.
10. Verify that the AC and DC LEDs on the MFR-PSA lights green.
11. Re-install the front panel.

POWER1 replacement is now complete.

Handle

Tab

4.

9.

Appendix 4. Replacing the Menu Display

The following procedure shows how to replace the menu display.
Replacement is able to be performed while the main unit power is on.

1. Unfasten to remove the four fixing screws on the front panel sides and detach the front panel.

2. Turn off the menu display power supply by turning the dip switch to the OFF position.
3. Remove the four screws (shown) circled in red.
4. Pull out the menu display.
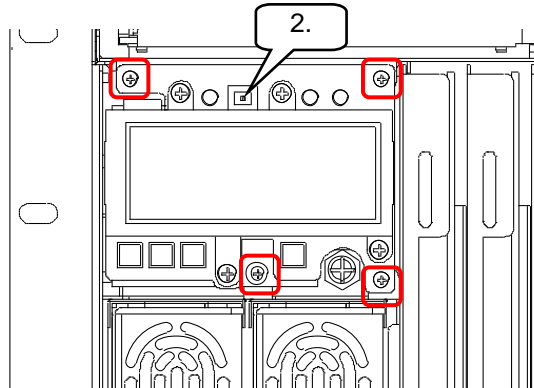
5. Grab the handle and slowly pull out the FRONT_MENU_CARD.

6. Insert a new FRONT_MENU_CARD to all the way in.
7. Confirm that the dip switch on the new menu display is set to the OFF position.
8. Install the new menu display into the FRONT_MENU_CARD connector.
9. Re-install the screws removed in Step 3.
10. Turn on the menu display power supply by turning the dip switch to the ON position.
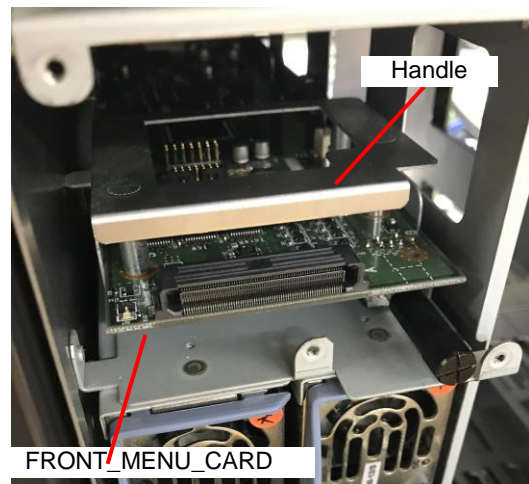
Menu display replacement is now complete.

Handle

FRONT_MENU_CARD

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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