



# OPERATION MANUAL

RF POWER AMPLIFIER

CA1300BW1-5766R-SL

R&K Company Limited

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## Revision History

Version	Date	Author(s)	Revision Note
1	September 7, 2015	R. Kotsubo	Original
2	December 9, 2015	R. Kotsubo	
3	February 10, 2016	R. Kotsubo	
Description of Change	INTERFACE (pg 35-59 of ver.2) is deleted. (Moved to Software Manual.) Small Note is added on pg15.		

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## IMPORTANT SAFETY INSTRUCTION

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### BEFORE APPLYING POWER

Review this manual and become familiar with all safety markings and instructions. Verify that the equipment line voltage selection is compatible with the main power source.

Protection provided by the equipment may be impaired if used in a manner not specified by R&K.

### SAFETY GROUND

This equipment is provided with an earth terminal. The main power source to the equipment must supply an uninterrupted safety ground of sufficient size to the input wiring terminals or power cord.

The equipment **MUST NOT BE USED** if protection is impaired.

### PHYSICAL DAMAGE

The RF amplifier should not be operated if there is physical damage, if there is missing hardware, or missing panels.

### Indications in the manual



**DANGER** Indicates a hazardous situation that, if not avoided, will result in death or serious injury.



**WARNING** Indicates a hazardous situation that, if not avoided, could result in death or serious injury.



**CAUTION** Indicate a hazardous situation that, if not avoided, could result in minor or moderate injury.

## RANGE OF ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe under the following environmental conditions:

- Indoor use
- Operation Temperature of 40°F(+4°C) to 113°F (45°C)
- Storage Temperature of 5°F(-15°C) to 131°F (55°C)
- 10% to 100% relative humidity with a 50°F dew point

## Safety Regulations



DANGER

During the operation of the product, do not touch the power supply or wiring section.

Touching them may cause electric shock resulting in death due to the application of high voltage.



WARNING

To supply the power to the product, connect the power cable to a grounded power outlet, so that the product can be grounded when used. Supplying the power without grounding the product may cause electric shock resulting in injury or death. This may also cause damage to the product.

Be sure to install the product in accordance with the prescribed installation procedures. Failure to install the product in accordance with the prescribed installation procedures may cause the product to become unbalanced and fall with a slight impact, possibly resulting in injury.

Using the product with its inlet and exhaust ports being blocked due to the installation situation may destroy the product or result in fire.

## Safe Handling

Our products or the components used in them may contain materials listed below. Please exercise sufficient caution in handling and disposal.

- Compound Semiconductors
- Beryllium Oxide (BeO)
- Cobalt Metal Powders (Ferrite, etc.)
- Other Materials that may have an effect on the human body or the environment

Capacitors and Backup Power Supplies, etc. may have built-in batteries that contain heavy metals. Normally, the risk from such products is insignificant; however, if they are damaged or exposed to strong electron beams or X-rays, etc. they may have severe effects on the human body, living organisms, or the environment.

Even if our products and applications that contain our products are functioning properly, they may have direct or indirect effects on the human body or the environment due to electromagnetic wave interference, etc. that was unforeseen at the development and manufacturing stages.

Applications that contain our products may pose a risk to the human body or the environment. We do not guarantee the safety of such applications. Manufacturing and use of such Applications is at your own risk and discretion.

We assume no responsibility or liability for damage resulting from use of our products for any purpose other than that of normal use.

## Safe Disposal

Our products, their components, and applications that contain our products must never be thrown away with general industrial waste or domestic waste because they may contain hazardous materials.

Please contact R&K sales representatives or sales representatives of R&K's authorized distributors before disposing of any of the materials listed above. (This caution applies to regular products, RoHS-compliant products, and all other R&K products.)

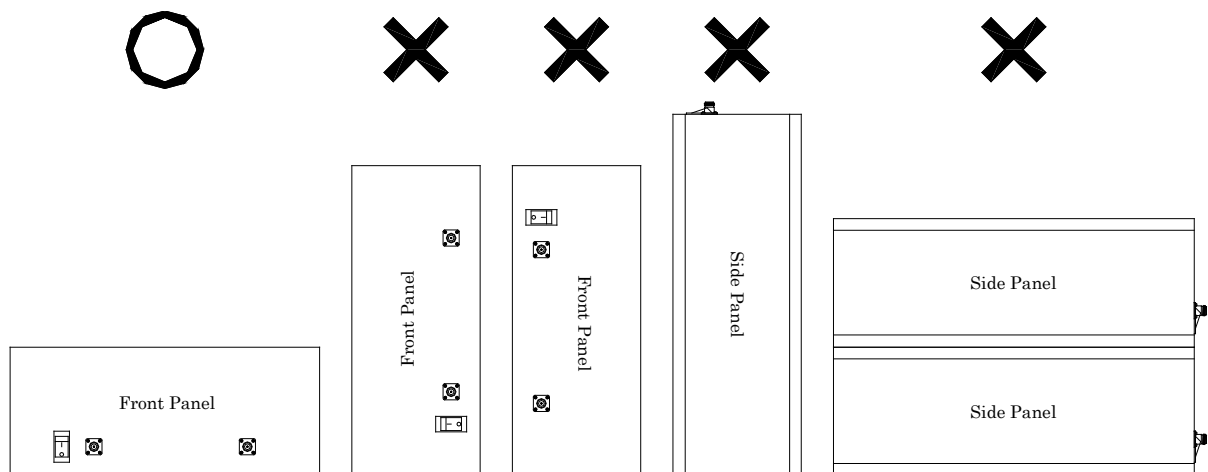
## Installation

Before proceeding, thoroughly inspect the amplifier for signs of physical damage that may have been incurred during shipment and completely read the following installation and operating instructions with care.

When hanging this product, please hang with four eye bolts. (Not 2 point hanging)

## Location

Install the product in the horizontal orientation, as shown below. Do not install one product on top of another.



## Installation Environment and Conditions

Avoid any of the environments described below because they may cause product faults.

- Location with strong vibration
- Humid or dusty location
- Location exposed to direct sunlight
- Location that may be exposed to active gas
- Locations with large fluctuations in power voltage
- Location that may be exposed to water

## Noise

The product has been designed with adequate care against noise to the AC line, but make sure that you use the product in a location with as low noise as possible. If noise is unavoidable, reduce the noise by using a noise removal filter or other appropriate means. Failure to operate the product with noise removal may prevent the product from operating normally or full performance. This may also cause damage to the product.

## Cautions on Applying Power

To avoid the accidents listed below, be careful when applying the power.

- Bodily injury due to electric shock.
- Damage to the interior of the product due to abnormal voltage.
- Malfunction due to ground current.
- Damage to the interior of the product due to power supply noise.

## Power Supply Wiring

Before wiring the power to the product, confirm that the power to the product is OFF. Be sure to use the power cable supplied with the product. If, however, using the product in a country other than Japan, use a power cable that conforms to the safety standard of that country.

Be sure to route all the supplied cables before applying the power to the product.

Before applying the power, confirm that the voltage of the power to be supplied to the product matches the product's voltage.

## Range of Power Supply Voltage

The AC power to be applied to the product must be in the power voltage range specified in this operation manual or in the specifications. Failure to apply the AC power within the specified AC power voltage range may cause damage to the product.

## Protective Grounding

To prevent electric shock, be sure to perform protective grounding before applying the power to the product.



WARNING

Using the product without grounding it may cause electric shock. Be sure to protectively ground the product before use.



## Export Regulations

In accordance with the Foreign Exchange and Foreign Trade Law and other relevant laws and regulations of Japan, permission for export from the Japanese government may be required in order to export our products or their internal components. In addition to consulting with the relevant authorities and experts in this field, please contact an R&K sales representative or authorized distributors if you have questions regarding export regulations. If you attempt to export our products out of Japan by yourself, the person in charge of the export shall assume all responsibilities.

## Intellectual Property

Any and all patent, design, and other intellectual property rights related to our products including, but not limited to, their internal devices and manufacturing processes belong to R&K. We do not assign or transfer such intellectual property rights, in whole or in part, or grant licenses to you. If you have a request in this regard, please contact an R&K sales representative or sales representatives of R&K's authorized distributors.

## Quality Assurance

R&K guarantees that the product has been found to meet the applicable standards in the inspection before shipment and that in inspection tests, measuring instruments have been calibrated in reference to those standards whose traceability has been ensured by public calibration organizations.

## Guarantee Period

We guaranteed that we will repair our products free of charge if they become faulty for design or manufacturing reasons within two years after delivery.

Note, however, that the following cases are not covered by the guarantee stated above:

- Fault and damage due to a handling error such as erroneous operation or improper use by you or any third party.
- Fault and damage due to conversion or repair by you or any third party.
- Fault and damage due to use by you or any third party that exceeds the range of the specifications.
- Fault and damage resulting from inappropriate handling by you or any third party such as fall or impact during transportation or movement by you or any third party.
- Fault and damage attributable to force majeure (external factors) such as fire, salt damage, gas damage, earthquake, lightening, wind damage, water damage, or other acts of providence.
- Fault and damage due to any connection equipment, applied equipment, applied part, or external components other than those designated.
- Fault and damage due to the use of a power supply other than those designated.
- This guarantee is effective only to R&K products that you purchase from R&K or R&K's authorized distributors, and is not applicable to resold products.

## TABLE OF CONTENTS

Safety Regulations.....	2-9
SECTION 1: GENERAL INFORMATION	
1.1 General Description.....	11
1.2 Specification.....	11
1.3 Power Supplies.....	12
1.4 Protection Circuits.....	12
SECTION 2: OPERATING INSTRUCTIONS	
2.1 Panel Features.....	13
2.1.1 Terminal Unit.....	13
2.1.2 Control Unit-Front Panel.....	14
2.1.3 Control Unit-Rear Panel.....	16
2.1.4 Driver Amp. Unit.....	18
2.1.5 Final Amp. Unit-1.....	20
2.1.6 Final Amp. Unit-2.....	22
2.1.7 Final Amp. Unit-3.....	24
2.1.8 P.S. Unit.....	26
2.1.9 Heat Exchanger Unit.....	28
2.2 Wiring.....	29
2.3 Interface.....	35
SECTION 3:	MAINTENANCE.....60
SECTION 4:	INSTALLATION.....61

# 1. GENERAL INFORMATION

## 1.1 GENERAL DESCRIPTION

The Model CA1300BW1-5766R-SL is a self-contained, water-cooled, narrowband, completely solid state Radio Frequency amplifier covering 1.3GHz  $\pm$ 100kHz.

## 1.2 SPECIFICATIONS

Frequency	1.3GHz $\pm$ 100kHz
Rated Output Power	3.8 kW minimum @CW (1 dB Compression) of 1.3 GHz power at 1dB compression with less than 10dBm input RF power.
Maximum Input Power	+13dBm max
Input / Output Impedance	50 $\Omega$ Nominal
Operation Mode	Class-AB Linear
RF Stability	0.1% rms amplitude stable and 0.1 degree rms phase stable over a one second period. Also the output power should not change more than 0.5% with a 1°C change in the cooling water or external air temperature.
Small Signal Gain	+56.8dB (min.) @ 1dB bandwidth $\geq$ $\pm$ 0.5MHz of 1.3GHz
Amplitude Flatness	5 % (max.) @ $\pm$ 100kHz of 1.3GHz
Phase Linearity	5deg (max.) @ $\pm$ 100kHz of 1.3GHz
Delay	300ns (max.)
Phase Variation	10deg (max.) @Po=200W~3.8kW
Harmonics Power	-30.0dBc (max.) @Po=380W, 1.9kW, 3.8kW
Spurious power	-70.0dBc (max.) @Po=380W, 1.9kW, 3.8kW
Power Supply Voltage	AC480V $\pm$ 10% / 3 $\Phi$ , 4Wire, 60Hz AC120V $\pm$ 10% / 1 $\Phi$ , 2Wire, 60Hz DC power supply output voltage variable range 30%~100% of normal value @Po=3.8kW
Consumption Power	15kVA (max.)
Connectors	RF IN : N-Female $\times$ 50 $\Omega$ termination RF OUT : WR650 Waveguide AC 120V Power Supply Input : 63-18165 (Meltric) AC 480V Power Supply Input : 63-38047 (Meltric) External 24V interlocks : BNC-Female 24V Fault Indicator Lines : BNC-Female Ethernet : RJ45
Ambient Conditions	
Operation Temperature	40°F (+4°C) to 113 °F(+45°C) (No dew drop w/h dew-sensors)
Storage Temperature	5°F (-15°C) to 131°F(+55°C) (No dew drop w/h dew-sensors)
Elevation	900 ft, above sea level
Humidity	10% to 100% relative humidity with a 50°F dew point

Cooling	Water cooling
Weight	628kg
Dimensions	W:761mm×D:1269mm×H:2133.6mm
Noise Figure	10dB (max.)
Efficiency	40% (min.) @ Po=3.8kW (@ 1 dB Compression) ※Efficiency from AC480V input to @ 3.8kW RF output
RF Reflections and Transistor Pallet Failure	All final-transistors are protected individually by each circulator and the dummy loads against the RF power which are internally terminated.
Reliability and Protection	The reliability of the SSA is less than 1% of the transistor pallets fail per 2000 hours of operation, and other failures (e.g., of power supply) that require more than one hour to repair do not occur more than once on average per 30,000 hours of operation. An internal interlock system is to be provided that shuts off the SSA under various failure conditions (e.g. from overheating, large RF reflection and water leaks).
LCW Cooling	
Water Input Pressure	40-40-75psi (normal), 150psi (max.), pressure drop across each SSA is $\leq 30$ psi
Water Temperature	+30degC +/-0.5degC variation over 24hrs
Water Flow Rate	4 gpm (max.)

### 1.3 POWER SUPPLIES

The Main Power Supply of CA1300BW1-5766R-SL is H.A.P.S. (high availability power supply). Six power supplies run in parallel with redundancy.

### 1.4 PROTECTION CIRCUITS

Features incorporated into this unit include temperature protection circuits, over reflection power protection circuit, flow rate protection circuit and AC input abnormality detection circuit. Please refer the Register Map (Page 42-43)

## 2. OPERATING INSTRUCTIONS

### 2.1 Panel Features

#### 2.1.1 Terminal Unit

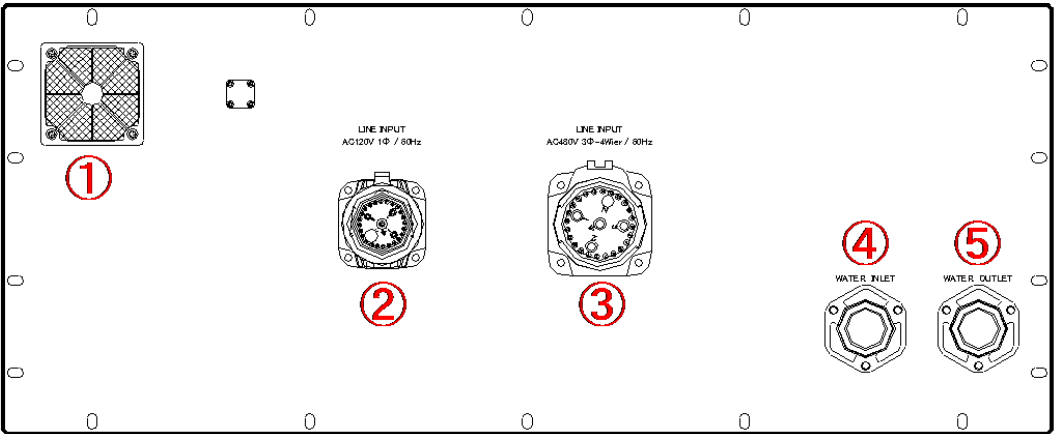


Fig. 1-1 Terminal Unit

Title		Function
1	Vent	Replaceable air vent with dust filter.
2	LINE INPUT AC120V 63-18165 (Meltric)	Cable connector for AC 120V power supply. (+/-10% 1Φ, 60Hz) 1. AC120V IN(L) 2. AC120V IN(N) 3. GND
3	LINE INPUT AC 480V 63-38047 (Meltric)	Cable connector for AC 480V power supply. ( +/- 5%, 3Φ, 60Hz) 1. AC480V IN(L-1) 2. AC480V IN(L-2) 3. AC480V IN(L-3) 4. AC480V IN(NL) 5. GND
4	WATER INLET Male JIC/SAE 37° Connector	Water inlet.
5	WATER OUTLET Male JIC/SAE 37° Connector	Water outlet.

## 2.1.2 Control Unit-Front Panel

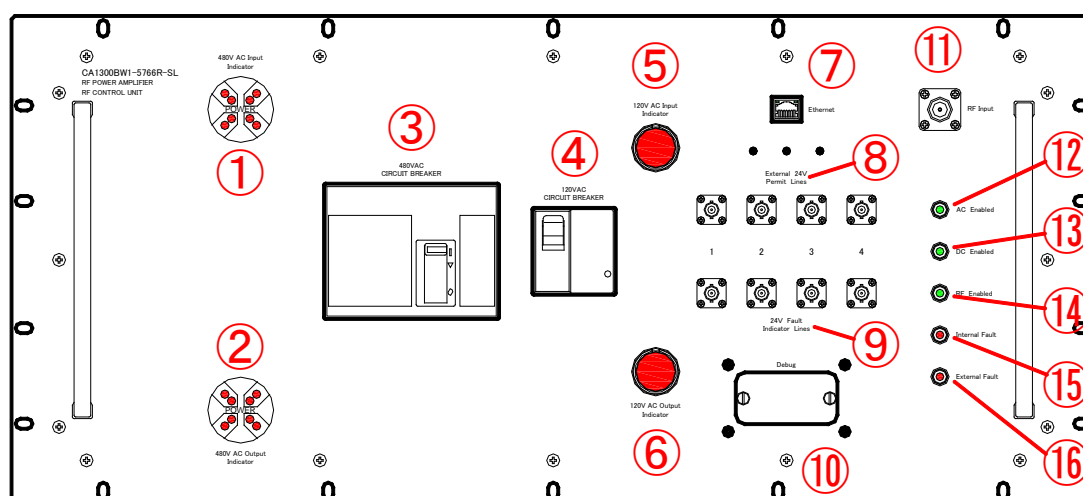


Fig. 1-2 Control Unit - Front Panel

Title	Function
1 480V AC INPUT INDICATOR	Lights up red when 480V AC power input (primary side) is given.
2 480V AC OUTPUT INDICATOR	Lights up red when 480V AC power is output. (CIRCUIT BREAKER is closed)
3 480V AC CIRCUIT BREAKER	Circuit Breaker for AC 480V.
4 120V AC CIRCUIT BREAKER	Circuit Breaker for AC 120V.
5 120V AC INPUT INDICATOR	Lights up red when 120V AC power input (primary side) is given.
6 120V AC OUTPUT INDICATOR	Lights up red when 120V AC power is output. ((CIRCUIT BREAKER is closed)
7 ETHERNET CONNECTOR	Connector for access to Ethernet.
8 EXTERNAL 24V PERMIT LINES	BNC connector for external systems.
9 24V FAULT INDICATOR LINES	BNC connector for external systems. If any fault condition occurs, drop all four 24 V output lines to the fault condition (Below 5V).
10 DEBUG	DF11 connector to update product software.  *Note – Please do not use this connector for normal operation. In the event the connector is used for normal operation, the configuration of this product will be damaged.

11	RF INPUT	N-Female connector for RF signal input.
12	AC ENABLED	Lights up green when the front panel 480V AC circuit breaker is closed.
13	DC ENABLED	Lights up green when the power supply is enabled.
14	RF ENABLED	Lights up green when the input RF is given.
15	INTERNAL FAULT	Lights up red if internal fault is found.
16	EXTERNAL FAULT	Lights up red if external fault is found.

\*Please refer the Register Map (Page 42)



## 2.1.3 Control Unit-Rear Panel

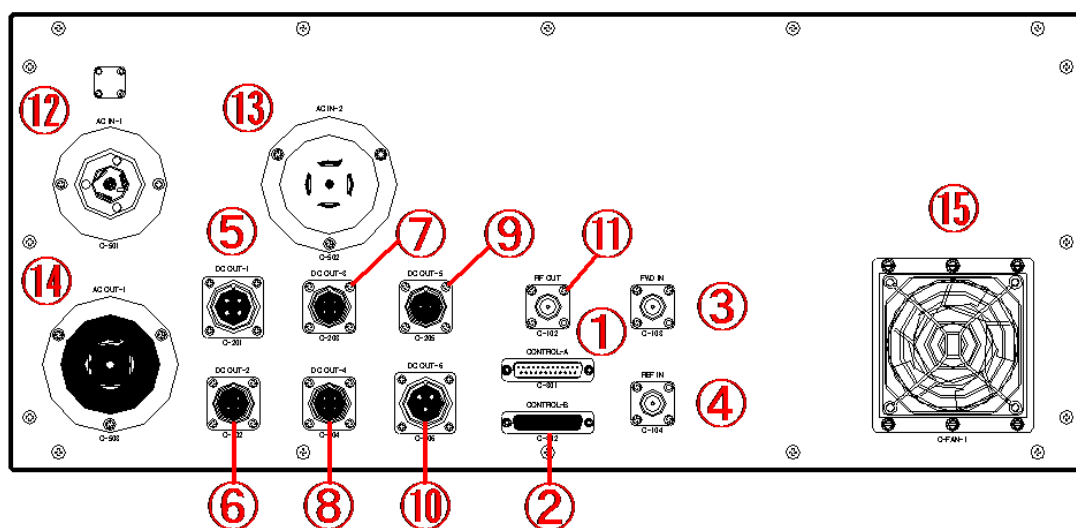


Fig. 1-3 Control Unit - Rear Panel

Title	Function
1 CONTROL-A (C-301, Red)	D-Sub-25pin-Male connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the P.S. UNIT CONTROL-B.
2 CONTROL-B (C-302, Red)	D-Sub-25pin-Female connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the DRIVER AMP UNIT CONTROL-A.
3 FWD IN (C-103, Red)	N-Female connector for Forward Power input.
4 REF IN (C-104, White)	N-Female connector for Reflection Power input.
5 DC OUT-1 (C-201, Red) N/MS3102A18-10S	Cable connector to supply 12V and 24V DC power to DRIVER AMP UNIT.
6 DC OUT-2 (C-202, Red) N/MS3102A14S-2S	Cable connector to supply 12V and 24V DC power to FINAL AMP UNIT-1
7 DC OUT-3 (C-203, Red) N/MS3102A14S-2S	Cable connector to supply 12V and 24V DC power to FINAL AMP UNIT-2.
8 DC OUT-4 (C-204, Red) N/MS3102A14S-2S	Cable connector to supply 12V and 24V DC power to FINAL AMP UNIT-3.

9	DC OUT-5 (C-205, Red) N/MS3102A14S-9S	Cable connector to supply 24V DC power to P.S. UNIT.
10	DC OUT-6 (C-206, Red) N/MS3102A18-21S	Cable connector to supply 24V DC power to HEAT EXCHANGER UNIT.
11	RF OUT (C-102, Green)	N-Female connector to output RF signal to DRIVER AMP UNIT.
12	AC IN-1 (C-501, Red) HBL4586C	Inlet socket for AC 120V power supply from TERMINAL UNIT.
13	AC IN-2 (C-502, Red) HBL2835	Inlet socket for AC 480V power supply from TERMINAL UNIT.
14	AC OUT-1 (C-503, Red) HBL2836	Inlet socket to supply AC power to P.S. UNIT.
15	C-FAN-1	Replaceable Cooling Fan.

## 2.1.4. DRIVER AMP. UNIT

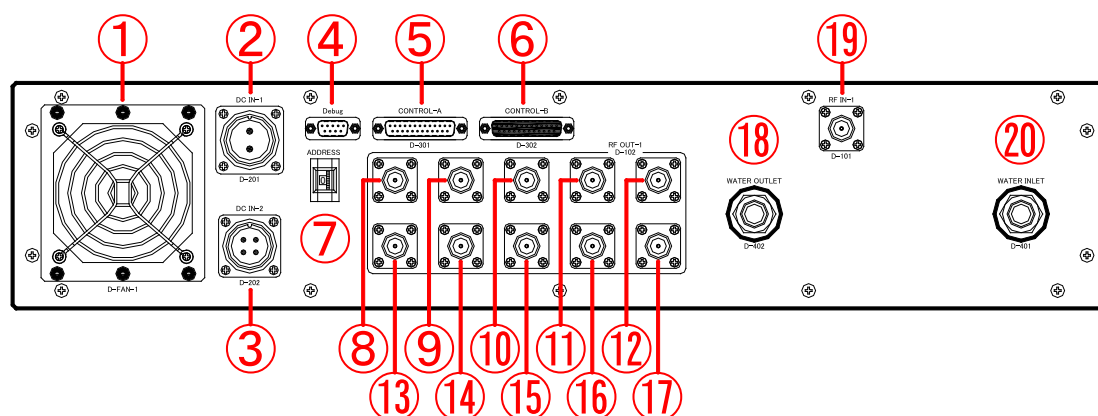


Fig. 1-4 DRIVER AMP. UNIT - Rear Panel

Title	Function
1 D-FAN-1	Replaceable cooling fan.
2 DC IN-1 (D-201, Green) N/MS3102A20-23P	Cable connector for 48V DC power supply from P.S. UNIT.
3 DC IN-2 (D-202, Green) N/MS3102A18S-10P	Cable connector for 12V and 24V DC power supply from CONTROL UNIT.
4 DEBUG	D-sub-9pin-Male connector to update product software.  *Note – Please do not use this connector for normal operation. In the event the connector is used for normal operation, the configuration of this product will be damaged.
5 CONTROL-A (D-301, Green)	D-Sub-25pin-Male connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the CONTROL UNIT CONTROL-B.
6 CONTROL-B (D-302, Green)	D-Sub-25pin-Female connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the FINAL AMP UNIT-1 CONTROL-A.
7 ADDRESS	Identification code “0”.

8	RF OUT-1 (D-102-1, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-1.
9	RF OUT-1 (D-102-3, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-1.
10	RF OUT-1 (D-102-5, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-1.
11	RF OUT-1 (D-102-7, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-1.
12	RF OUT-1 (D-102-9, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-3.
13	RF OUT-1 (D-102-2, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-2.
14	RF OUT-1 (D-102-4, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-2.
15	RF OUT-1 (D-102-6, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-2.
16	RF OUT-1 (D-102-8, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-2.
17	RF OUT-1 (D-102-10, Green)	N-Female connector to output RF signal to FINAL AMP UNIT-3.
18	WATER-OUTLET (D-402, Green)	Water outlet to FINAL AMP UNIT-1.
19	RF IN-1 (D-101, Green)	N-Female connector for RF signal input from CONTROL UNIT.
20	WATER-INLET (D-401, Green)	Water inlet from WATER UNIT.

## 2.1.5. FINAL AMP. UNIT-1

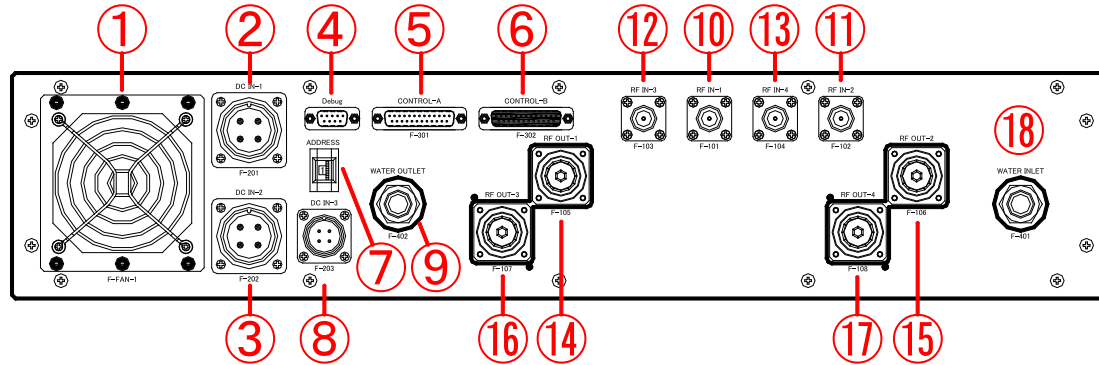


Fig. 1-5 FINAL AMP. UNIT-1 – Rear Panel

Title	Function
1 F-FAN-1	Replaceable cooling fan.
2 DC IN-1 (F-201, Brown) N/MS3102A22-22P	Cable connector for 48V DC power supply from P.S. UNIT.
3 DC IN-2 (F-202, Brown) N/MS3102A22-22P	Cable connector for 48V DC power supply from P.S. UNIT.
4 DEBUG	D-sub-9pin-Male connector to update product software.  *Note – Please do not use this connector for normal operation. In the event the connector is used for normal operation, the configuration of this product will be damaged.
5 CONTROL-A (F-301, Brown)	D-Sub-25pin-Male connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the DRIVER AMP UNIT CONTROL-B.
6 CONTROL-B (F-302, Brown)	D-Sub-25pin-Female connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the FINAL AMP UNIT-2 CONTROL-A.

7	ADDRESS	Identification code "1".
8	DC IN-3 (F-203, Brown) N/MS3102A14S-2P	Connector for 12V and 24V DC power supply from CONTROL UNIT.
9	WATER-OUTLET (F-402, Brown)	Water outlet to FINAL AMP UNIT-2.
10	RF IN-1 (F-101, Brown)	N-Female connector for RF signal input from DRIVER AMP UNIT.
11	RF IN-2 (F-102, Brown)	N-Female connector for RF signal input from DRIVER AMP UNIT.
12	RF IN-3 (F-103, Brown)	N-Female connector for RF signal input from DRIVER AMP UNIT.
13	RF IN-4 (F-104, Brown)	N-Female connector for RF signal input from DRIVER AMP UNIT.
14	RF OUT-1 (F-105, Brown)	7/16 DIN connector to output RF signal to Radial Combiner.
15	RF OUT-2 (F-106, Brown)	7/16 DIN connector to output RF signal to Radial Combiner.
16	RF OUT-3 (F-107, Brown)	7/16 DIN connector to output RF signal to Radial Combiner.
17	RF OUT-4 (F-108, Brown)	7/16 DIN connector to output RF signal to Radial Combiner.
18	WATER-INLET (F-401, Brown)	Water inlet from DRIVER AMP UNIT.

## 2.1.6. FINAL AMP. UNIT-2

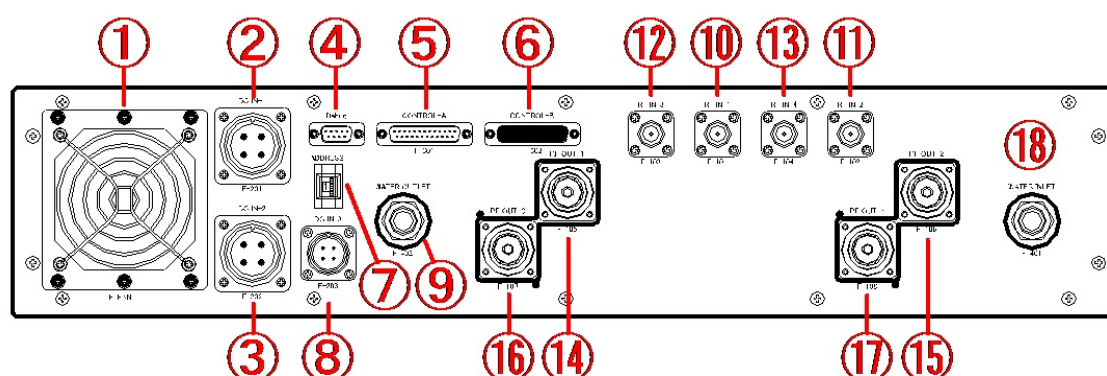


Fig. 1-6 FINAL AMP. UNIT-2 – Rear Panel

Title	Function
1 F-FAN-1	Replaceable cooling fan.
2 DC IN-1 (F-201, Purple) N/MS3102A22-22P	Cable connector for 48V DC power supply from P.S. UNIT.
3 DC IN-2 (F-202, Purple) N/MS3102A22-22P	Cable connector for 48V DC power supply from P.S. UNIT.
4 DEBUG	D-sub-9pin-Male connector to update product software. *Note – Please do not use this connector for normal operation. In the event the connector is used for normal operation, the configuration of this product will be damaged.
5 CONTROL-A (F-301, Purple)	D-Sub-25pin-Male connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the FINAL AMP UNIT-1 CONTROL-B.
6 CONTROL-B (F-302, Purple)	D-Sub-25pin-Female connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the FINAL AMP UNIT-3 CONTROL-A.
7 ADDRESS	Identification code “2”.
8 DC IN-3 (F-203, Purple)	Cable connector for 12V and 24V DC power supply from

	N/MS3102A14S-2P	CONTROL UNIT.
9	WATER-OUTLET (F-402, Purple)	Water outlet to WATER UNIT.
10	RF IN-1 (F-101, Purple)	N-Female connector for RF signal input from DRIVER AMP UNIT.
11	RF IN-2 (F-102, Purple)	N-Female connector to input RF signal from DRIVER AMP UNIT.
12	RF IN-3 (F-103, Purple)	N-Female connector to input RF signal from DRIVER AMP UNIT.
13	RF IN-4 (F-104, Purple)	N-Female connector to input RF signal from DRIVER AMP UNIT.
14	RF OUT-1 (F-105, Purple)	7/16 DIN connector to output RF signal to Radial Combiner.
15	RF OUT-2 (F-106, Purple)	7/16 DIN connector to output RF signal to Radial Combiner.
16	RF OUT-3 (F-107, Purple)	7/16 DIN connector to output RF signal to Radial Combiner.
17	RF OUT-4 (F-108, Purple)	7/16 DIN connector to output RF signal to Radial Combiner.
18	WATER-INLET (F-401, Purple)	Water inlet from FINAL AMP UNIT-1.



## 2.1.7. FINAL AMP. UNIT-3

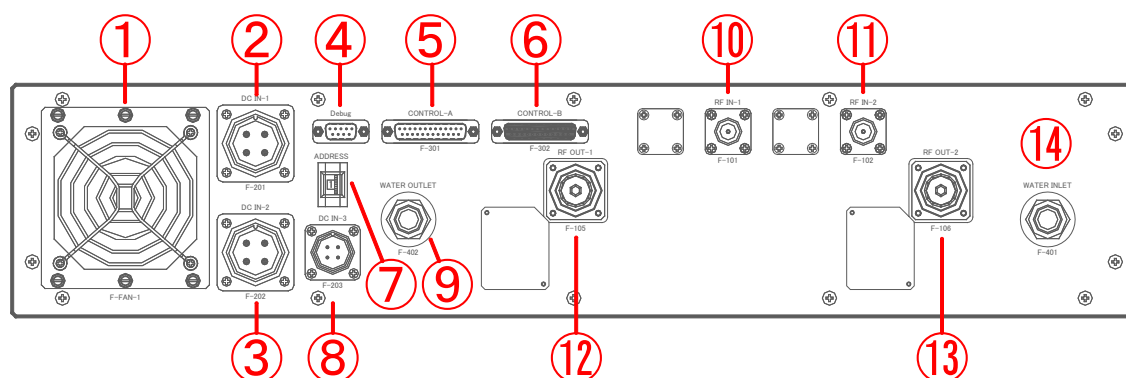


Fig. 1-7 FINAL AMP. UNIT-3 – Rear Panel

Title	Function
1 F-FAN-1	Replaceable cooling fan.
2 DC IN-1 (F-201, Black) N/MS3102A22-22P	Cable connector for 48V DC power supply from P.S. UNIT.
3 DC IN-2 (F-202, Black) N/MS3102A22-22P	Cable connector for 48V DC power supply from P.S. UNIT.
4 DEBUG	D-sub-9pin-Male connector to update product software.  *Note – Please do not use this connector for normal operation. In the event the connector is used for normal operation, the configuration of this product will be damaged.
5 CONTROL-A (F-301, Black)	D-Sub-25pin-Male connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the FINAL AMP UNIT-2 CONTROL-B.
6 CONTROL-B (F-302, Black)	D-Sub-25pin-Female connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the P.S.UNIT CONTROL-A.
7 ADDRESS	Identification code “3”.
8 DC IN-3 (F-203, Black)	Cable connector for 12V and 24V DC power supply from

	N/MS3102A14S-2P	CONTROL UNIT.
9	WATER-OUTLET (F-402, Black)	Water outlet to HEAT EXCHANGER UNIT.
10	RF IN-1 (F-101, Black)	N-Female connector for RF signal input from DRIVER AMP UNIT.
11	RF IN-2 (F-102, Black)	N-Female connector for RF signal input from DRIVER AMP UNIT.
12	RF OUT-1 (F-105, Black)	7/16 DIN connector to output RF signal to Radial Combiner.
13	RF OUT-2 (F-106, Black)	7/16 DIN connector to output RF signal to Radial Combiner.
14	WATER-INLET (F-401, Black)	Water inlet from WATER UNIT.

## 2.1.8. P.S. UNIT

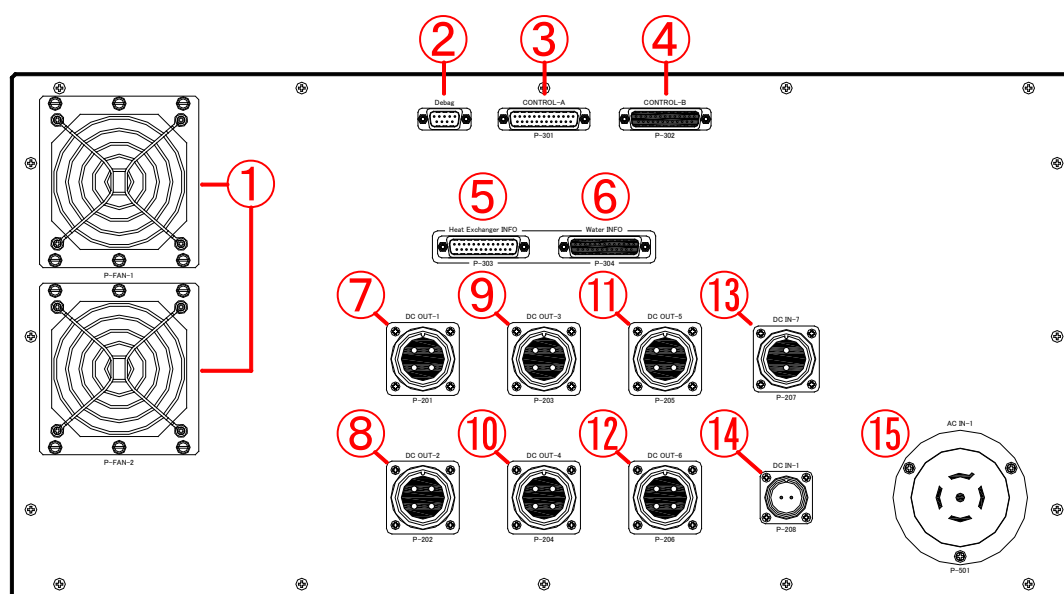


Fig. 1-8: P.S. Unit

	Title	Function
1	P-FAN-1,2	Replaceable cooling fan.
2	DEBUG	D-sub-9pin-Male connector to update product software. *Note – Please do not use this connector for normal operation. In the event the connector is used for normal operation, the configuration of this product will be damaged.
3	CONTROL-A (P-301, Yellow)	D-Sub-25pin-Male connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the FINAL AMP UNIT-3 CONTROL-B.
4	CONTROL-B (P-302, Yellow)	D-Sub-25pin-Female connector for Monitoring the power voltage, consumption current of each device and surface temperature of heatsinks, and sending the obtained operation data. It is connected to the CONTROL UNIT-3 CONTROL-A.
5	HEAT EXCHANGER INFO (P-303, Blue)	D-Sub-25pin-Male connector for monitoring internal temperature of HEAT EXCHANGER UNIT. It is connected to HEAT EXCHANGER UNIT

6	WATER INFO (P-304, Blue)	D-Sub-25pin-Female connector for monitoring water flow rate. It is connected to WATER UNIT.
7	DC OUT-1 (P-201, Yellow) N/MS3102A22-22S	Cable connector to supply 48V DC power to FINAL AMP UNIT-1.
8	DC OUT-2 (P-202, Yellow) N/MS3102A22-22S	Cable connector to supply 48V DC power to FINAL AMP UNIT-1.
9	DC OUT-3 (P-203, Yellow) N/MS3102A22-22S	Cable connector to supply 48V DC power to FINAL AMP UNIT-2.
10	DC OUT-4 (P-204, Yellow) N/MS3102A22-22S	Cable connector to supply 48V DC power to FINAL AMP UNIT-2.
11	DC OUT-5 (P-205, Yellow) N/MS3102A22-22S	Cable connector to supply 48V DC power to FINAL AMP UNIT-3.
12	DC OUT-6 (P-206, Yellow) N/MS3102A22-22S	Cable connector to supply 48V DC power to FINAL AMP UNIT-3.
13	DC OUT-7 (P-207, Yellow) N/MS3102A20-23S	Cable connector to supply 48V DC power to DRIVER AMP UNIT.
14	DC IN (P-208, Yellow) N/MS3102A14S-9P	Connector for 24V DC power supply from CONTROL UNIT.
15	AC IN (P-501, Yellow) HBL2835	Connector for AC 480V power supply from CONTROL UNIT.

2.1.9. HEAT EXCHANGER UNIT

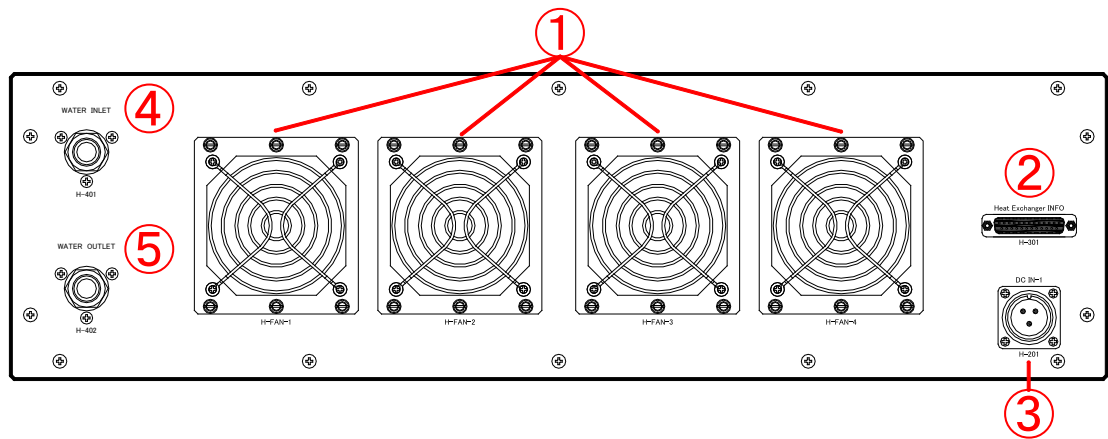


Fig. 1-9: Heat Exchanger Unit

Title	Function
1 H FAN-1,2,3,4	Replaceable cooling fan.
2 HEAT EXCHANGER INFO (H-301, Blue)	D-Sub-25pin-Female connector for monitoring internal temperature. It is connected to P.S. UNIT.
3 DC IN-1 (H-201, Blue) N/MS3102A18-21P	Cable connector for 24V DC power supply from CONTROL UNIT.
4 WATER-INLET (H-401, Blue)	Water inlet from FINAL AMP UNIT-3.
5 WATER-OUTLET (H-402, Blue)	Water outlet to WATER UNIT.

2.2. WIRING

All cables and connectors has number (e.g.C-102) and colored. Connect same number and color.

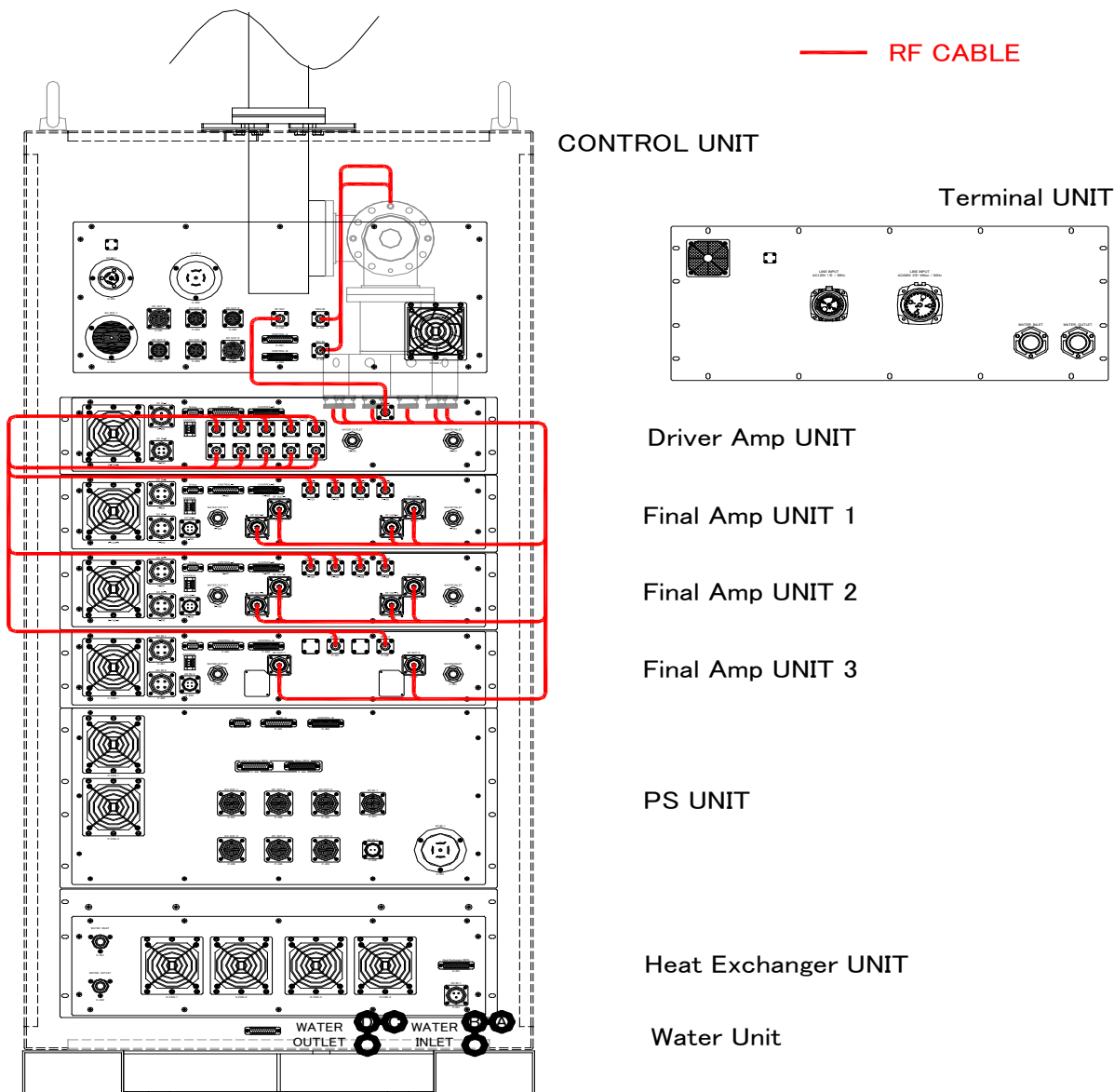


Fig. 2-1: Wiring Diagram of RF Output Cables

## RF Cables

UNIT NAME	CONNECTOR NAME		UNIT NAME	CONNECTOR NAME
CONTROL UNIT	RF OUT C-102	⇔	DRIVER AMP UNIT	RF IN-1 D-101
DRIVER AMP UNIT	RF OUT-1 D-102-1	⇔	FINAL AMP UNIT-1	RF IN-1 F-101
DRIVER AMP UNIT	RF OUT-1 D-102-2	⇔	FINAL AMP UNIT-1	RF IN-2 F-102
DRIVER AMP UNIT	RF OUT-1 D-102-3	⇔	FINAL AMP UNIT-1	RF IN-3 F-103
DRIVER AMP UNIT	RF OUT-1 D-102-4	⇔	FINAL AMP UNIT-1	RF IN-4 F-104
DRIVER AMP UNIT	RF OUT-1 D-102-6	⇔	FINAL AMP UNIT-2	RF IN-1 F-101
DRIVER AMP UNIT	RF OUT-1 D-102-7	⇔	FINAL AMP UNIT-2	RF IN-2 F-102
DRIVER AMP UNIT	RF OUT-1 D-102-8	⇔	FINAL AMP UNIT-2	RF IN-3 F-103
DRIVER AMP UNIT	RF OUT-1 D-102-9	⇔	FINAL AMP UNIT-2	RF IN-4 F-104
DRIVER AMP UNIT	RF OUT-1 D-102-5	⇔	FINAL AMP UNIT-3	RF IN-1 F-101
DRIVER AMP UNIT	RF OUT-1 D-102-10	⇔	FINAL AMP UNIT-3	RF IN-2 F-102
FINAL AMP UNIT-1	RF OUT-1 F-105	⇔	RADIAL COMBINER	R-101
FINAL AMP UNIT-1	RF OUT-2 F-106	⇔	RADIAL COMBINER	R-102
FINAL AMP UNIT-1	RF OUT-3 F-107	⇔	RADIAL COMBINER	R-103
FINAL AMP UNIT-1	RF OUT-4 F-108	⇔	RADIAL COMBINER	R-104
FINAL AMP UNIT-2	RF OUT-1 F-105	⇔	RADIAL COMBINER	R-105
FINAL AMP UNIT-2	RF OUT-2 F-106	⇔	RADIAL COMBINER	R-106
FINAL AMP UNIT-2	RF OUT-3 F-107	⇔	RADIAL COMBINER	R-107
FINAL AMP UNIT-2	RF OUT-4 F-108	⇔	RADIAL COMBINER	R-108
FINAL AMP UNIT-3	RF OUT-1 F-105	⇔	RADIAL COMBINER	R-109
FINAL AMP UNIT-3	RF OUT-2 F-106	⇔	RADIAL COMBINER	R-110

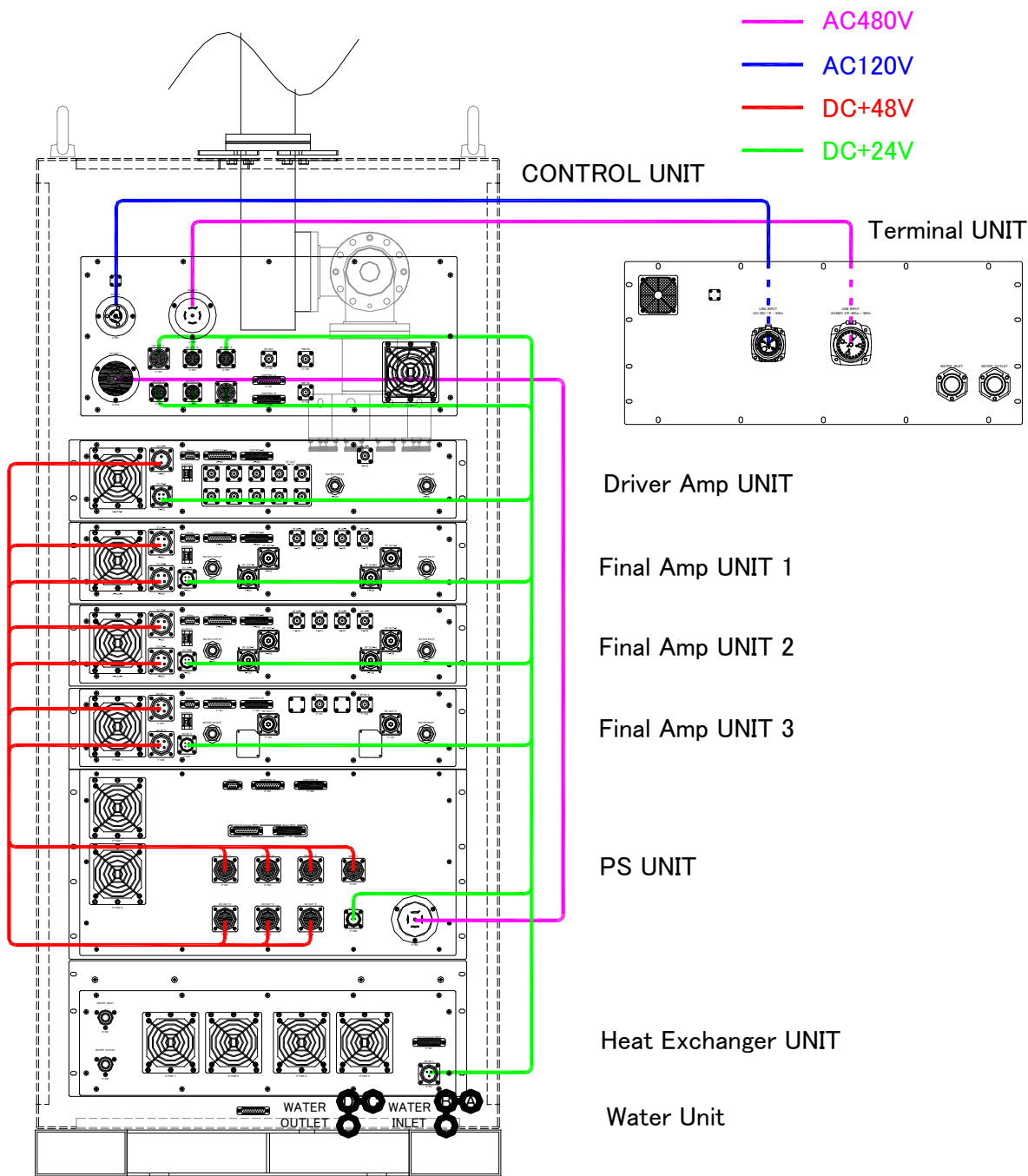


Fig. 2-2: Wiring Diagram of Power Supply Cables



## POWER SUPPLY Cables

UNIT NAME	CONNECTOR NAME		UNIT NAME	CONNECTOR NAME
TERMINAL UNIT	LINE INPUT AC120V	↔	CONTROL UNIT	AC-IN-1 C-501
TERMINAL UNIT	LINE INPUT AC480V	↔	CONTROL UNIT	AC-IN-2 C-502
CONTROL UNIT	AC OUT-1 C-503	↔	P.S. UNIT	AC IN-1 P-501
P.S. UNIT	DC OUT-1 P-201	↔	FINAL AMP UNIT-1	DC IN-1 F-201
P.S. UNIT	DC OUT-2 P-202	↔	FINAL AMP UNIT-1	DC IN-2 F-202
P.S. UNIT	DC OUT-3 P-203	↔	FINAL AMP UNIT-2	DC IN-1 F-201
P.S. UNIT	DC OUT-4 P-204	↔	FINAL AMP UNIT-2	DC IN-2 F-202
P.S. UNIT	DC OUT-5 P-205	↔	FINAL AMP UNIT-3	DC IN-1 F-201
P.S. UNIT	DC OUT-6 P-206	↔	FINAL AMP UNIT-3	DC IN-2 F-202
P.S. UNIT	DC OUT-7 P-207	↔	DRIVER AMP UNIT	DC IN-1 D-201
CONTROL UNIT	DC OUT-1 C-201	↔	DRIVER AMP UNIT	DC IN-2 D-202
CONTROL UNIT	DC OUT-2 C-202	↔	FINAL AMP UNIT-1	DC IN-3 F-203
CONTROL UNIT	DC OUT-3 C-203	↔	FINAL AMP UNIT-2	DC IN-3 F-203
CONTROL UNIT	DC OUT-4 C-204	↔	FINAL AMP UNIT-3	DC IN-3 F-203
CONTROL UNIT	DC OUT-5 C-205	↔	P.S. UNIT	DC IN-1 P-208
CONTROL UNIT	DC OUT-6 C-206	↔	HEAT EXCHANGER UNIT	DC IN-1 H-201

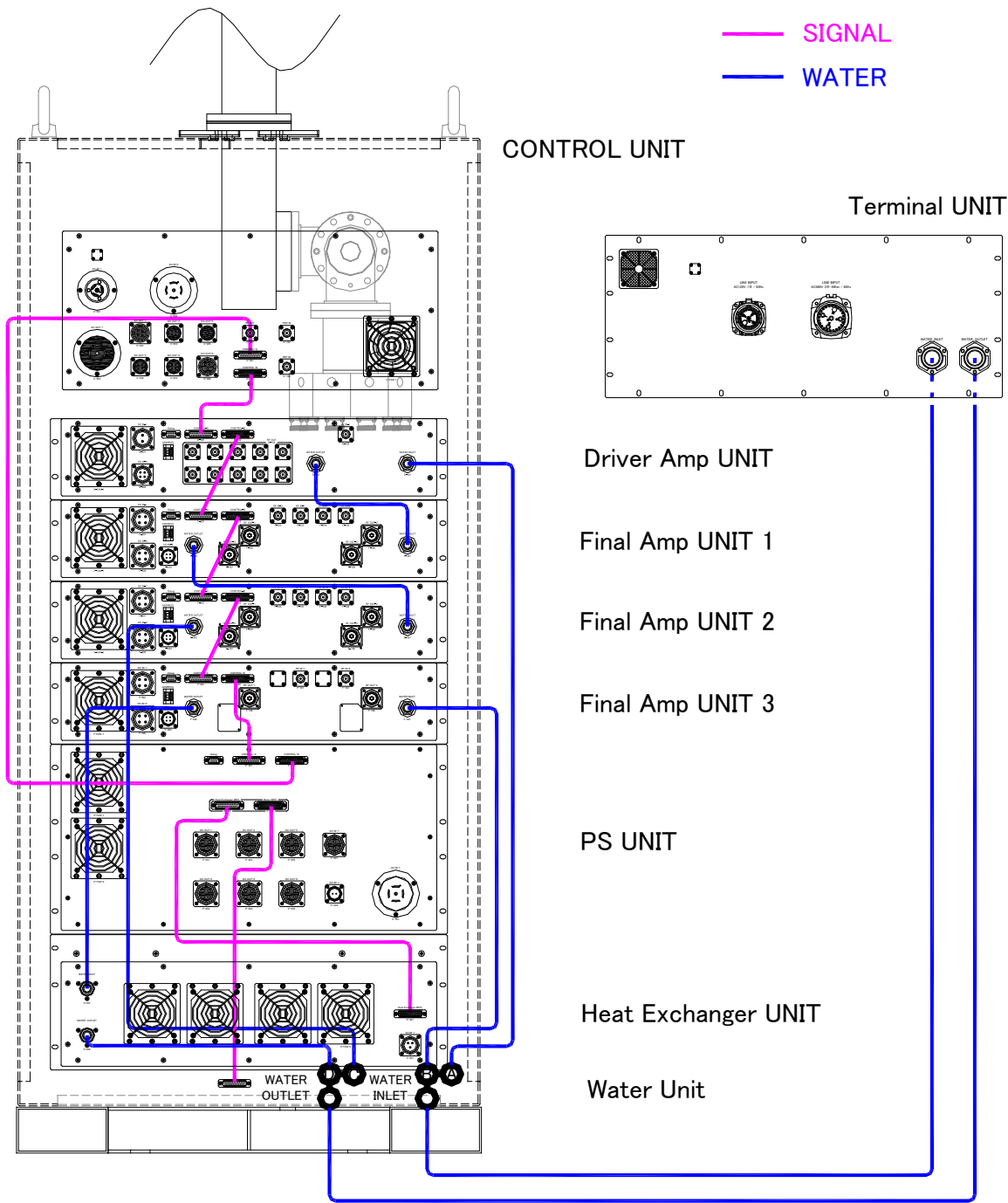


Fig. 2-3: Wiring Diagram of CONTROL Cables

## CONTROL Cables

UNIT NAME	CONNECTOR NAME		UNIT NAME	CONNECTOR NAME
CONTROL UNIT	CONTROL-A C-301	↔	P.S. UNIT	CONTROL-B P-302
P.S. UNIT	CONTROL-A P-301	↔	FINAL AMP UNIT-3	CONTROL-B F-302
FINAL AMP UNIT-3	CONTROL-A F-301	↔	FINAL AMP UNIT-2	CONTROL-B F-302
FINAL AMP UNIT-2	CONTROL-A F-301	↔	FINAL AMP UNIT-1	CONTROL-B F-302
FINAL AMP UNIT-1	CONTROL-A F-301	↔	DRIVER AMP UNIT	CONTROL-B D-302
DRIVER AMP UNIT	CONTROL-A D-301	↔	CONTROL UNIT	CONTROL-B C-302
P.S. UNIT	HEAT EXCHANGER INFO P-303	↔	HEAT EXCHANGER UNIT	HEAT EXCHANGER INFO H-301
P.S. UNIT	WATER INFO P-304	↔	WATER UNIT	WATER INFO W-101

## WATER Cables

UNIT NAME	CONNECTOR NAME		UNIT NAME	CONNECTOR NAME
TERMINAL UNIT	WATER INLET	↔	WATER UNIT	WATER INTLET
TERMINAL UNIT	WATER OUTLET	↔	WATER UNIT	WATER OUTLET
WATER UNIT	WATER INLET A	↔	DRIVER AMP UNIT	WATER INLET D-401
DRIVER AMP UNIT	WATER OUTLET D-402	↔	FINAL AMP UNIT-1	WATER INLET F-401
FINAL AMP UNIT-1	WATER OUTLET F-402	↔	FINAL AMP UNIT-2	WATER INLET F-401
FINAL AMP UNIT-2	WATER OUTLET F-402	↔	WATER UNIT	WATER OUTLET C
WATER UNIT	WATER INLET B	↔	FINAL AMP UNIT-3	WATER INLET F-401
FINAL AMP UNIT-3	WATER OUTLET F-402	↔	HEAT EXCHANGER UNIT	WATER INLET H-401
HEAT EXCHANGER UNIT	WATER OUTLET H-402	↔	WATER UNIT	WATER OUTLET D

### 3. MAINTENANCE

Daily, ensure that the Power is on for all the modules and that there are no Fault lights.

#### Cleaning

Be sure to turn off the power and unplug the power supply cable before starting the cleaning. Clean the product suitably by using a soft cloth. You may use a cloth soaked in diluted mild detergent to remove persistent dirt.

Observe the following cautions:

- Do not allow any water fall into the product.
- Do not use any organic solvent such as Benzene, Toluene, Xylene, Acetone, etc.
- Do not use any polishing agent such as cleanser.

#### Storage

Store the product in the temperature range specified in this operation manual or specifications. When not using the product for a long time (over 90 days), store the product with drying agents in humidity-proof bag. Do not store the product in dusty places or in locations exposed to direct sunlight.

#### Technical support

Should you need any technical information or assistance, please contact R&K via e-mail [info@rkco.jp](mailto:info@rkco.jp) or telephone, 81-545-31-2609

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Website: <http://rk-microwave.com/en/>

Please refer to the maintenance manual for detail.

## 4. Installation

### Before Unpacking

- The installation and adjustment of the amplifiers should be made by qualified personnel.
- Read the operating instructions carefully and follow all directions regarding connection and adjustment of the amplifier.
- Consider all appropriate references in the operating instructions before attaching external devices that do not belong to the amplifier.
- At time of receipt, verify that the product delivered is the product ordered. Check the product name and serial number.

### Unpacking

- Leave the product in its original packing box until you are ready to install. Store packing boxes in a clean, dry area at ambient temperatures between 5°F (-15°C) and 131°F (55°C).
- If the box or amplifier is damaged, please notify R&K. If you suspect that there is a problem with the amplifier that may affect its safe operation, do not install such a faulty Amplifier.
- Please be careful not to damage the product when cutting the vacuum packaging.

**When hanging this product, please hang with four eye bolts. (Not 2 point hanging)**

## Installation

This product will be delivered with wiring done, please make sure all cable connectors are securely inserted.

1. Open the back door and take out a WAVEGUIDE, and fix it to the top panel with the supplied bolts. Connect WAVEGUIDE to your 50 $\Omega$  load.
2. Connect water hose or pipe to the WATER INLET and WATER OUTLET of Terminal UNIT. Check for any water leakage from water hoses and confirm the water rate is appropriate.
3. Connect Ethernet cable to the Control Unit front panel. Confirm it is fixed firmly.
4. Connect external systems to the Control Unit.
5. Connect RF cable to the RF IN connector of Control Unit. Use an N connector torque wrench to tighten to the specified torque value. Maximum Input Level should be below -20dBm.
6. Connect the AC power cable (120V, 480V) to the Terminal Unit. Supply the power (primary side) and check that INPUT INDICATOR (Control Unit-Front Panel 1 and 5) is flickering and lit in red.
7. Close AC120V breaker and AC480V breaker and check that INPUT INDICATOR (Control Unit-Front Panel 2 and 6) is flickering and lit in red.

Please refer to the installation manual for detail.