For your reference:

Please note that this product is no longer available and is provided as a reference technical document.

HIGH SPEED BIPOLAR AMPLIFIER

BA4850

Instruction Manual

NF Corporation

DA00015616-003

HIGH SPEED BIPOLAR AMPLIFIER

BA4850

Instruction Manual

— Preface —

Thank you for purchasing the BA4850 high speed bipolar power amplifier.
To ensure safe and proper use of this electric equipment, please read first **Safety Precautions** on the following pages.

● Caution Symbols Used in This Manual

The following caution symbols are used in this manual. Be sure to observe these caution symbols and their contents to ensure the safety of the user and avoid damage to the equipment.

⚠ WARNING

This mark indicates information for the avoidance of a hazard such as electric shock that may endanger human life or cause injury during handling of the equipment.

⚠ CAUTION

This mark indicates information for the avoidance of damage to the equipment during handling.

● This manual has the following chapter organization.

If reading this manual for the first time, start from 1. OVERVIEW.

1. OVERVIEW

Describes the overview, features, applications, functions, and brief operation principles.

2. PREPARATIONS BEFORE USE

Describes various cautions regarding preparations to be made before using the BA4850.

3. PANEL FEATURES AND BASIC OPERATIONS

Describes features, behavior, and basic operation of panel knobs. Read this chapter while operating the device.

4. ADVANCED OPERATIONS

Describes advanced operations.

5. TROUBLESHOOTING

Describes error messages and countermeasures to be taken when a failure is likely to have occurred.

6. MAINTENANCE

Describes how to store, re-pack, and transport the device, how to run the performance test, and so on.

7. SPECIFICATIONS

Describes the specifications including functions and performance.

— Safety Precautions —

To ensure safe use, be sure to observe the following warnings and cautions.
NF Corporation shall not be held liable for damages that arise from a failure to observe these warnings and cautions.
This product is a Class 1 product (with protective conductor terminal) that conforms to the JIS and IEC insulation standards.

- **Be sure to observe the contents of this instruction manual.**
  This instruction manual contains information for the safe operation and use of this product.
  Be sure to read this information first before using this product.
  All the warnings in the instruction manual must be heeded to prevent hazards that may cause major accidents.

- **Be sure to ground the product.**
  This product uses a line filter and must be grounded to avoid the risk of electric shock.
  To prevent electric shock, be sure to safely implement grounding according to Japanese Standard for Electrical Equipment Technology D (Type 3) or higher.
  This product is automatically grounded when its 3-prong power supply plug is connected to a 3-prong power outlet with a protective-ground contact.
  This product does not come with a 3-prong to 2-prong conversion adapter. When using a separately sold 3-prong to 2-prong conversion adapter, be sure to connect the grounding wire of the adapter to the grounding terminal next to the outlet.

- **Check the power supply voltage.**
  This product operates on the power supply voltage indicated in **Grounding and Power Supply Connection** in this instruction manual.
  Prior to connecting the power supply, check that the voltage of the power supply matches the rated power supply of the product.

- **In case of suspected anomaly**
  If this product emits smoke, an abnormal smell, or abnormal noise, immediately power it off and stop using it.
  If such an anomaly occurs, do not use this product until it has been repaired, and immediately report the problem to the location of purchase (either NF Corporation or your distributor).

- **Do not use this product when gas is present.**
  An explosion or other such hazard may result.

- **Do not remove the cover.**
  This product contains high-voltage parts. Absolutely never remove its cover.
  Even when the inside of this product needs to be inspected, do not touch the inside. All such inspections are to be performed by service technicians designated by NF Corporation.

- **Do not modify this product.**
  Absolutely never modify this product, as this may cause new hazards and may disqualify this product from repair in case of failure.

● **Do not expose this product to water.**

When this product is used in wet condition, it may cause an electric shock and a fire. If this product is exposed to water, unplug the power cord immediately, and contact NF Corporation or one of our representatives.

● **If lightning occurs, power off this product and unplug the power cord.**

A lightning may cause an electric shock, a fire and a failure.

● **Safety-related symbols**

The general definitions of the safety-related symbols used on this product and in the instruction manual are provided below.

Instruction Manual Reference Symbol

This symbol is displayed to alert the user to potential danger and refer him/her to the instruction manual.

Electric Shock Danger Symbol

This symbol indicates locations that present a risk of electric shock under specific conditions.

Protective Ground-Terminal Symbol

This symbol identifies a pin that must be grounded to avoid an electric shock.

Before operating the device, be sure to safely implement grounding according to Japanese Standard for Electrical Equipment Technology D (Type 3, 100 Ω or lower) or higher.

⚠ WARNING

Warning Symbol

This symbol indicates information for avoiding danger to human life or bodily injury while handling this product.

⚠ CAUTION

Caution Symbol

This symbol indicates information for preventing damage to the product when handling it.

● **Other symbols**

This symbol indicates the “on” position of the power switch.

This symbol indicates the “off” position of the power switch.

This symbol indicates that the external conductor of the connector is connected to the case.

This symbol indicates that the external conductor of the connector is connected to the signal ground.

● **Notes for Disposal**

When disposing of this product, ask a company that handles industrial waste, to ensure environmental protection.

Contents

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Tables

1. OVERVIEW

1.1 General

The BA4850 is a wideband, high-speed bipolar power amplifier with a 50 MHz band capable of bipolar output of an output voltage and current.

Constant voltage (CV) output characteristics are supported, and the maximum output voltage and current are ±20 V (with no load) and ±1 A (DC), respectively.

Since the BA4850 performs bipolar output, the output voltage and current supply ranges over all four quadrants. A general DC power supply can supply only positive current (source current) in the case of positive voltage output. The BA4850, however, can supply both positive and negative (source and sink) current. The BA4850 can be used with DC, so that an offset waveform or a waveform asymmetric with regard to polarity can also be amplified.

1.2 Features

- **Wideband and high speed**

  The BA4850 has a frequency band from DC to 50 MHz and a slew rate as high as 6000 V/μs or more.

- **Low output impedance**

  With 3.3 Ω + 0.01 μH or less (typ.), the load range usable without being concerned about impedance matching is extended.

- **Output polarity switching function**

  A switch is provided to enable the BA4850 to be switched for use as an in-phase amplifier or a reversed-phase amplifier.

- **Protection function**

  The BA4850 protects against output overload and also protects against power supply faults, abnormal internal temperatures, and so forth.

- **Output on/off function**

  Output on/off control can be exercised by using the front panel switch or an external control.
  Moreover, an output state (output off or output on) at power-on time can be selected using the DIP switch on the rear panel.

- **Support of worldwide power supply input voltages**

  A voltage range from 100 to 230 VAC ±10% is supported. The input power factor control (PFC) function is provided.

1.3 Applications

- For testing and characteristics analysis of FEDs, liquid crystals, and so forth
- For testing and characteristics analysis of micro actuators and so forth
- For use as a booster amplifier for signal generators such as the WF series of NF Corporation
- For use as a power supply for capacitor ripple current testing
- For use as an actuator driver
- For characteristics testing of diodes and semiconductors such as SCR
- For characteristics testing of relays and switches
- For use as a power supply for testing in an inspection line for various components

1.4 List of Functions

The table below indicates the major functions of the BA4850.

Table 1-1. List of Functions

	Function	Description
Output	Output on/off switching	
	DC offset tuning	±0.5 V
	Gain setting	Fixed: ×1, ×2, ×5, ×10 Variable: ×1 to ×3
	Output polarity switching	In-phase or reversed-phase
	Overload protection and indication	
Other	To be set at power-on time	Output on/off, gain, and so forth

1.5 Principle of Operation

The BA4850 consists of a panel block, preamplifier block, power amplifier block, power supply block, and system control block. "**Figure 1-1 Block Diagram**" shows the block diagram of the BA4850.

The panel block provides the gain tuning, polarity switching, and offset tuning functions.

The power amplifier block performs power amplification and has protection functions.

The power supply block consists of the internal power supply block of the BA4850, and the DC power supply block for the power amplifier.

The system control block provides a user interface and interfaces among the blocks.

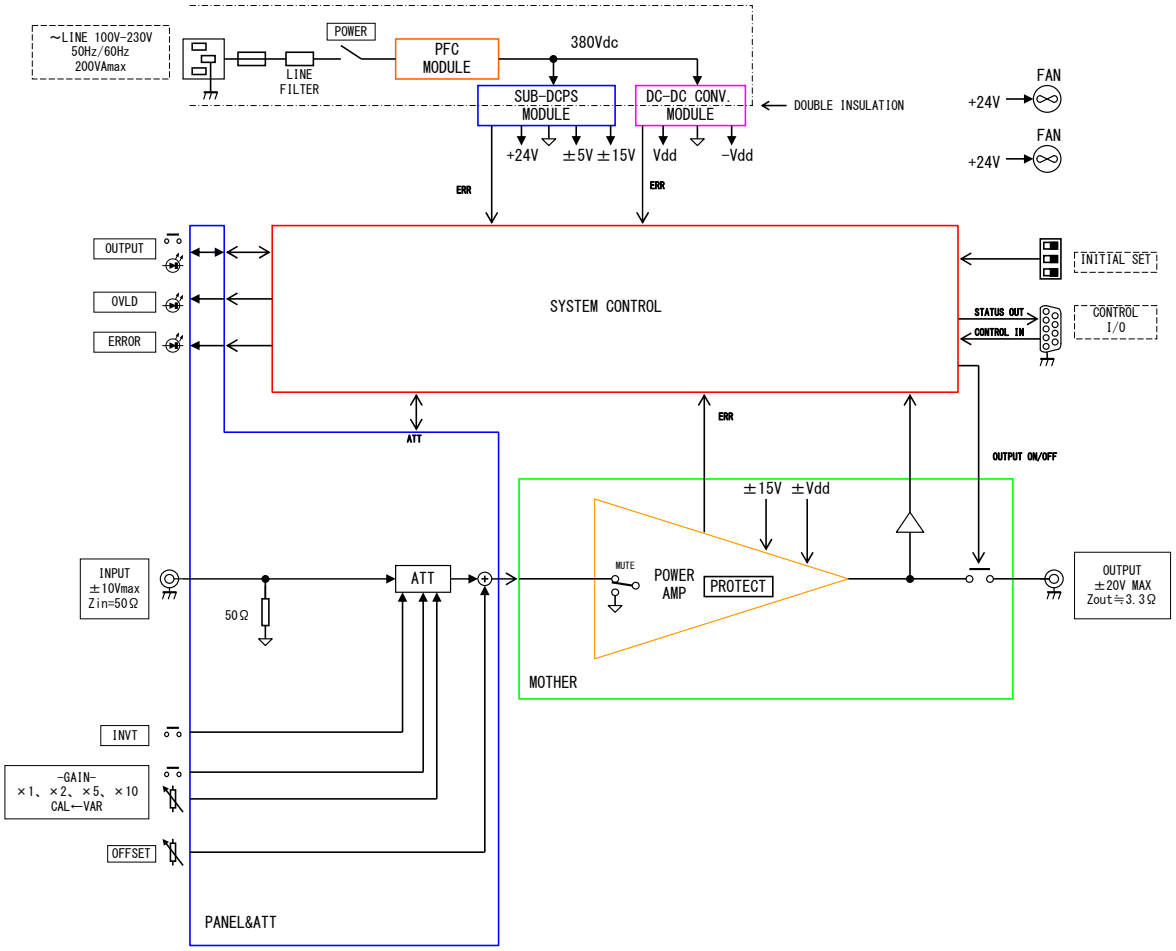


Figure 1-1. Block Diagram

2. PREPARATIONS BEFORE USE

2.1 Checking Before Use

■ Safety check

To ensure safety in using the BA4850, the user should read the following sections of this instruction manual before using the BA4850:

- **"Safety Precautions"** (provided at the beginning of this instruction manual)
- **"2.3 Grounding and Power Supply Connection"**

■ Appearance and accessories check

If an abnormality (such as a flaw or dent) is found on the outside surface of the corrugated box, carefully check if the product is adversely affected when removing the product from the corrugated box.

After opening the corrugated box, check the items contained in the box.
If an abnormality such as a flaw or dent is found on the product, or an accessory is missing, contact NF Corporation or its representative.

- Appearance check

  Check that no abnormalities such as a flaw and dent are found on the panel, controls, connectors, and so forth.

- Accessories check

  The accessories of this product are listed below. Check that there are no missing items and no flaws are found.

• Instruction manual (BA4850 Instruction Manual)	1
• Power cord set (varies depending on destination, 7 A/125 V for Japan)	1

⚠ WARNING

This product contains high-voltage parts. Never remove the cover.
All internal inspections of this product are to be performed only by service technicians qualified by NF Corporation.

2.2 Setup and Installation

■ Installation location

Do not place the BA4850, with its rear or side facing down, on a floor or desk.
Ensure that all of the four rubber legs at the bottom are placed on a plane surface such as a desk.
If the BA4850 is placed with its rear facing down, the BA4850 can fall, resulting in a product failure or physical harm.

■ Caution on transportation

When transporting the BA4850, hold the handles on the sides and ensure that the product is level.

■ Rack mounting

The BA4850 can be mounted in a metric- or inch-standard rack using mounting hardware. Contact the sales staff at NF Corporation and specify a metric or inch rack.

⚠ CAUTION

Rack mounting

- Use a rack with an effective depth of 70 cm or more.
- Retain the BA4850 by using a rail or shelf to withstand sufficient shock and vibration.
- Provide a space of 5 cm or more above and below the BA4850 to allow circulation of air for cooling the inside of the BA4850. Moreover, open the back of the rack to prevent air output from the rear panel from being contained in the rack, and separate the rack from the wall by 30 cm or more.

■ Installation location conditions

- Use the BA4850 indoors at an altitude of no higher than 2000 m.
- The BA4850 performs forced air cooling using fans. Separate the front, rear, and sides with air inlets and air outlets from the wall by 50 cm or more to assure ventilation.
- Install the BA4850 in a location that satisfies the following temperature and humidity ranges:

Operation guarantee	0°C to 40°C	5% to 85% RH. Absolute humidity 1 to 25 g/m^3, with no condensation.
Performance guarantee	+5°C to 35°C	5% to 85% RH. Absolute humidity 1 to 25 g/m^3, with no condensation.
Storage condition	−10°C to +50°C	5% to 95% RH. Absolute humidity 1 to 29 g/m^3, with no condensation.

Product reliability may decline in extreme temperature and/or humidity environments. An environment of approximately 25°C and 50%RH is recommended.

- Do not install the BA4850 in the following locations:
  - Location with flammable gas
    → An explosion may occur. Never install and use this product in such a location.
  - Outdoors, or location exposed to direct sunlight or near a fire or heat source
    → The full performance of this product may not be obtained, or failure may occur.
  - Location with corrosive gas, moisture, or high humidity
    → This product may become corroded or fail.
  - Location near an electromagnetic field source, high-voltage device, or power line
    → This product may malfunction.
    The output may become off if the BA4850 is exposed to a strong radiated radio frequency electromagnetic field.
  - Location exposed to excessive vibration
    → This product may malfunction or fail.
  - Location with excessive dust
    → In particular, electrically conductive dust may cause failure of this product.
- This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

2.3 Grounding and Power Supply Connection

■ Be sure to ground the BA4850.

⚠ WARNING

This product uses a line filter. Be sure to ground this product. Otherwise, an electric shock may occur.
To prevent an electric shock from occurring, be sure to ground the BA4850 according to "Electric Equipment Technical Standard Class D (100 Ω or below) Grounding" or higher.

This product is automatically grounded when its 3-prong power supply plug is connected to a 3-prong power outlet with a protective-ground contact.
This product does not come with a 3-prong to 2-prong conversion adapter. When using a separately sold 3-prong to 2-prong conversion adapter, be sure to connect the grounding wire of the adapter to the grounding terminal next to the outlet.

⚠ CAUTION

The power code set can be used for disconnecting the product from AC power line in case of emergency. Maintain enough space around the inlet, to be able to remove the connector of a power cord from the inlet. Use a power socket located at convenient place with adequate space around so that the plug can be removed from socket.

■ The power requirements of this product are as follows:

Voltage range:	100 V AC to 230 V AC ±10% (not exceeding 250 V)
	Overvoltage Category II
Frequency range:	50 Hz/60 Hz ±2 Hz (single phase)
Power consumption:	200 VA or less

■ Connect the power supply according to the following procedure:

1. Check that the commercial voltage supply to be connected is within the voltage range of the BA4850.
2. Turn off the power switch of the BA4850.
3. Insert the power cord supplied with the product into the inlet on the rear.
4. Insert the plug of the power cord into a 3-prong power outlet.

⚠ CAUTION

The power cord set accompanying this product for use in Japan conforms to the Electric Appliances and Material Safety Law and can be used only in Japan. The rated voltage is 125 VAC, and the dielectric strength is 1250 VAC. The product, shipped to Japan, cannot be used with a voltage exceeding 125 VAC and cannot be used outside Japan.

⚠ CAUTION

The power cord set delivered with this product is dedicated to this product.
Do not use the power cord for other products and applications.
Use only the attached power code set for connection to AC power line.

Note that the dielectric strength of only the main unit of this product is 1500 VAC.

2.4 Simplified Operation Check

This section describes the simplified operation check method, which may be used when the BA4850 is newly purchased or after being stored for a long time. For performance checking, refer to "**6.4 Performance Testing**".

⚠ WARNING

This product contains high-voltage parts. Never remove the cover.
All internal inspections of this product are to be performed only by service technicians qualified by NF Corporation.

- **Required measuring instruments**

  To make an operation check, the measuring instruments listed below are required.
  No load test is conducted. So a load (terminating) resistor is not needed.

Table 2-1. Required Measuring Instruments

Measuring instrument	Characteristics
Signal generator	Frequency: 1 kHz Waveform: Sine wave Output voltage: 0.5 Vrms or more (Load: 50 Ω) WF1965 1 CH 50 MHz synthesizer manufactured by NF Corporation, or equivalent
Oscilloscope	Frequency band: 200 MHz or more
Voltmeter	AC and DC voltage measurement Use a voltmeter that can measure 20 V or higher.

- Connection

  As shown in "**Figure 2-1 Standard Connection Diagram**", connect a signal generator, voltmeter, and oscilloscope.

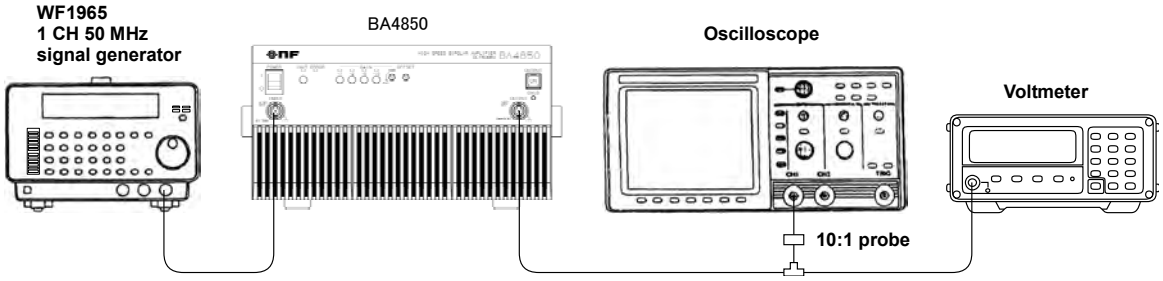


Figure 2-1. Standard Connection Diagram

- Panel setting

  Set the BA4850 and signal generator as indicated below.

Table 2-2. Panel Setting for Operation Check

BA4850

Item	Setting
GAIN	×10
VAR	CAL
INVT	OFF

Signal generator (WF1965)

Item	Setting
Frequency (FREQ)	1 kHz
Waveform (FUNCTION)	Sine wave
Output level (AMPTD)	0
Offset (OFFSET)	0

- Operation

⚠ WARNING

If the product generates smoke, smell, or sound, disconnect the power cord from the outlet immediately, and leave a notice that the product must not be used until the product is repaired.

1. Turn on the power switch.
   All LEDs on the push buttons turn on, the overload LED (OVLD) turns on, then all LEDs turn off. Next, the internal power supply error LED (ERR) blinks, and then turns off when the internal power supply is fixed. The state selected at power-on time is then set.
   If the gain setting is not ×10, change the setting.
2. Set the frequency of the signal generator to 1 kHz, the waveform to sine wave, and the voltmeter for AC measurement.
3. Increase the level gradually from 0 V, and set the BA4850 input voltage to 4 Vp-p (check the input voltage with the voltmeter).
4. Press the output ON/OFF switch then check, with the oscilloscope and voltmeter, that about 20 Vp-p is output on the output connector (OUTPUT). At the same time, check that the waveform does not have any distortion, such as clipping.
5. Switch the gain setting then check the output level.

GAIN	Output Level
×5	20 Vp-p
×2	8 Vp-p
×1	4 Vp-p

2.5 Calibration

Ensure that this product undergoes the testing described in "**6.4 Performance Testing**" at least once a year, depending on the use environment and use frequency. It is recommended to conduct a performance test before using it for an important measurement or test.

A performance test should be conducted by a person who has a general knowledge of measuring instruments and is familiar with measuring instrument handling.

3. PANEL FEATURES AND BASIC OPERATIONS

3.1 Panel Component Designations and Operations

3.1.1 Front panel

The number to the right of each component designation in the figure indicates the section where the component is described in detail.

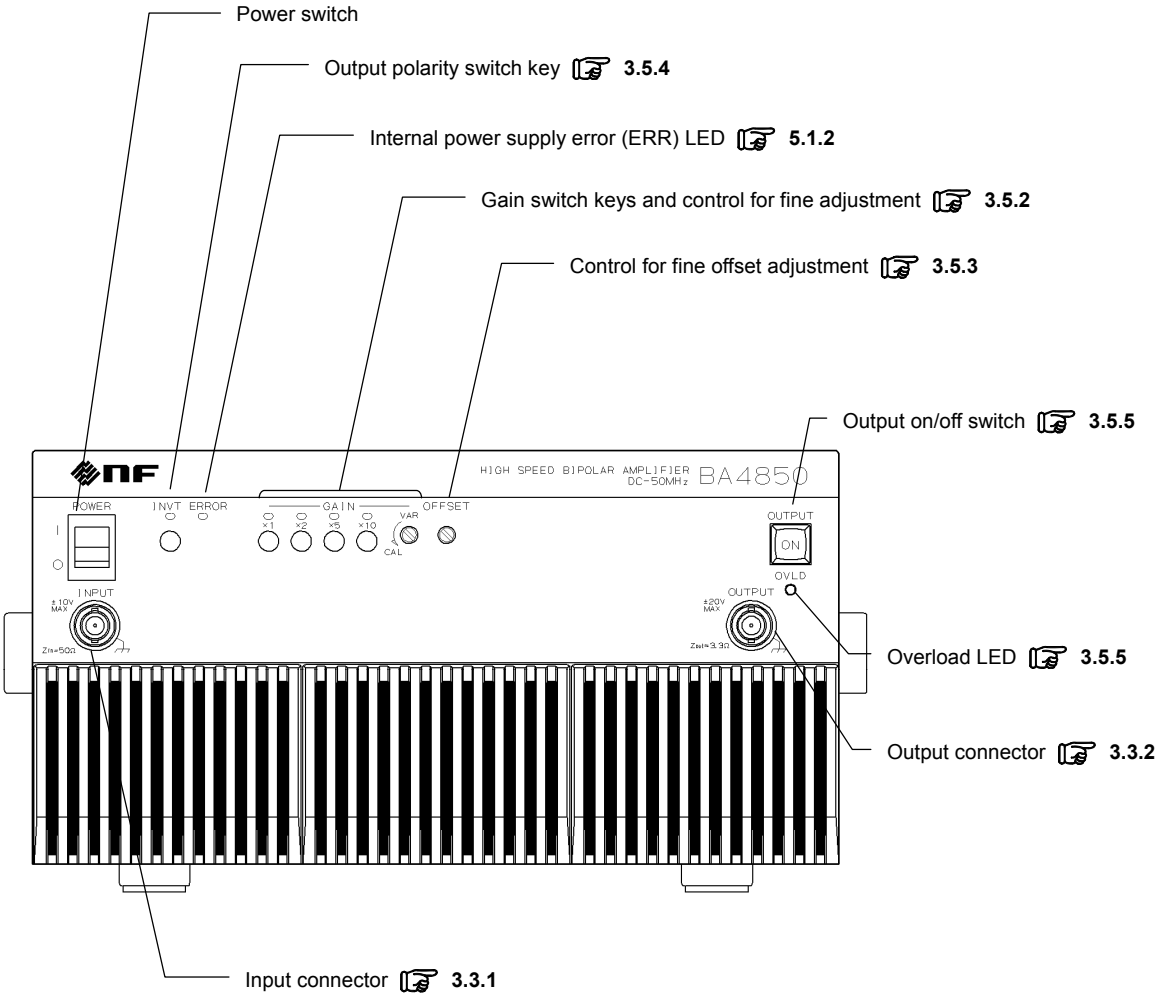


Figure 3-1. BA4850 Front Panel

3.1.2 Rear panel

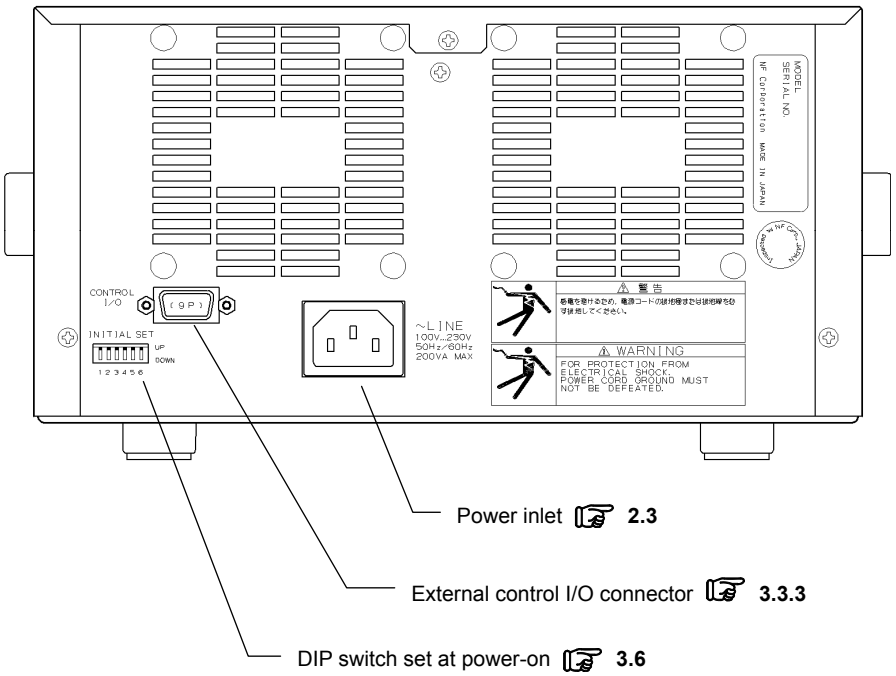


Figure 3-2. BA4850 Rear Panel

3.2 Indications at Power-on and Initialization

When the power switch is set to ON, the internal circuitry is automatically checked, and the BA4850 becomes ready for operation if no abnormality is detected. On the panel, the values set with the DIP switch are set. For the initial setting of the DIP switch, refer to "**3.6 Setting at Power-on**".
If the BA4850 cannot be operated after the power is turned on, a fault has occurred. Turn off the power immediately and then contact NF Corporation or its representative.
For fault diagnosis at Power-on, refer to "**5.1.1 Errors at Power-on**".

When the power is turned on, all LEDs on the push buttons turn on. Next, after the overload LED (OVLD) turns on, all LEDs turn off. Next, after the internal power supply error (ERR) LED blinks and then turns off when the internal power supply is determined, the state selected at Power-on is set.

3.3 I/O Terminals

3.3.1 Input connector

Signal input connectors are provided.

• Input connector	BNC connector (front)
• Input impedance	50 Ω
• Non-destructive maximum input voltage	±11 V

⚠ CAUTION

The BA4850 may be damaged if a voltage beyond the non-destructive maximum input voltage (±11 V) is applied.
Never apply a voltage beyond ±11 V.

3.3.2 Main output

A main output connector is provided.
For output voltage signal setting, refer to "**3.5.2 Output voltage adjustment**" to "**3.5.4 Output polarity switching**".

• Output connector	BNC connector (front panel)	
	Lo side is grounded to the housing.	
• Maximum output voltage	±20 V	DC to 20 MHz
	±14.2 V	20 MHz to 50 MHz
• Maximum output current	±1 A	DC
• Output impedance	3.3 Ω +0.01 μH or less (typ.)	

3.3.3 External control I/O

The BA4850 has an external control I/O connector with D-sub 9 pins.

Output on/off control can be exercised externally by using a no-voltage contact. (Refer to "**Figure 3-3 External Control I/O**".)

The overload state and output on/off state can be monitored externally. The overload state is indicated when a connection is made between pins 6 and 7. The output on state is indicated when a connection is made between pins 8 and 9.

To turn on output with the external control I/O function, turn on the power after depressing DIP switch 4 to be set at Power-on. (A DIP switch setting change made after operation is started is not reflected.) If output is turned on with the external control I/O function, the output on/off switch (OUTPUT) on the front panel can only be set to OFF.

After the external signal input level was changed, approx. 50ms might be required for the controller to execute a function as a maximum response time. “Output ON/OFF” additionally requires the similar time for a response of a relay device.

To turn on output again after output is turned off using the output on/off switch (OUTPUT), the control signal must first be turned off prior to turning on output.

Table 3-1. List of External Control I/O Connector Pins

(See "**Figure 3-3 External Control I/O**".)

Pin No.	Name	Description
1	+5 V	Power supply for external output on/off (50 mA or less)
6	External output on/off (A)	Connected to the primary side of the photocoupler via 150 Ω
2	External output on/off (K)	
7	+5 V common	Connected to the +5 V common potential (housing potential) via 100 Ω
4	Not used	–
3	Overload (C)	The overload state is set when a connection is made between pins 6 and 7. (15 V or less and 10 mA or less between the pins)
8	Overload (E)	
9	Output on/off (C)	The output on state is set when a connection is made between pins 8 and 9. (15 V or less and 10 mA or less between the pins)
5	Output on/off (E)	

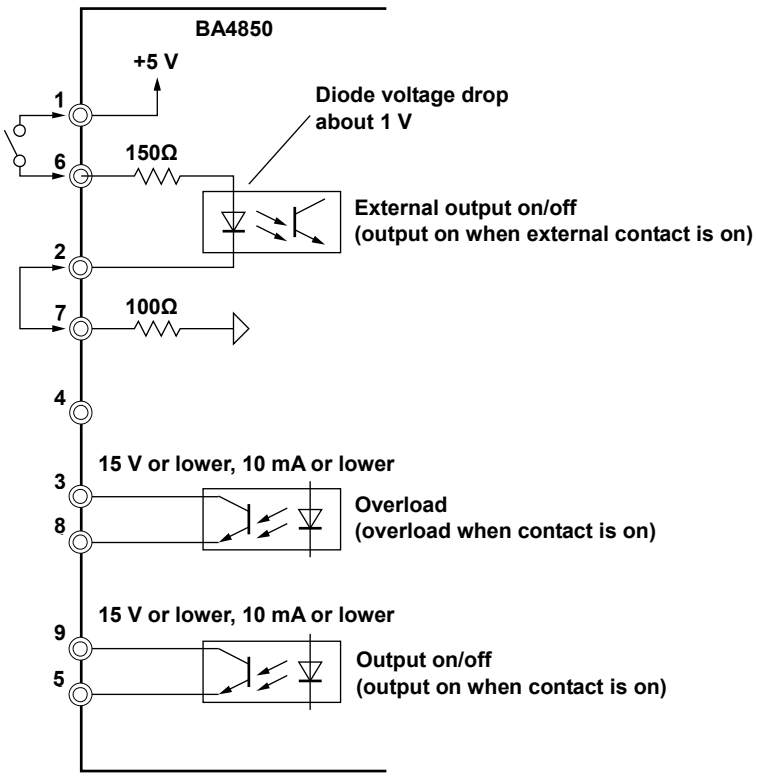


Figure 3-3. External Control I/O

3.4 I/O Connection

Figure 3-4 Basic Connection Diagram shows the connection diagram.

Wiring, load, and the measurement system (including wiring to the T-type divider or measuring instruments) are affected when a frequency of 1 MHz or more is used.

For full performance of the BA4850, connect a signal generator, signal cords, and a load, observing the descriptions provided in "**3.4.1 Signal generator**" through "**3.4.3 Load**".

⚠ CAUTION

Avoid putting the input and output cords in close proximity to each other. Doing so may cause ringing or oscillation.

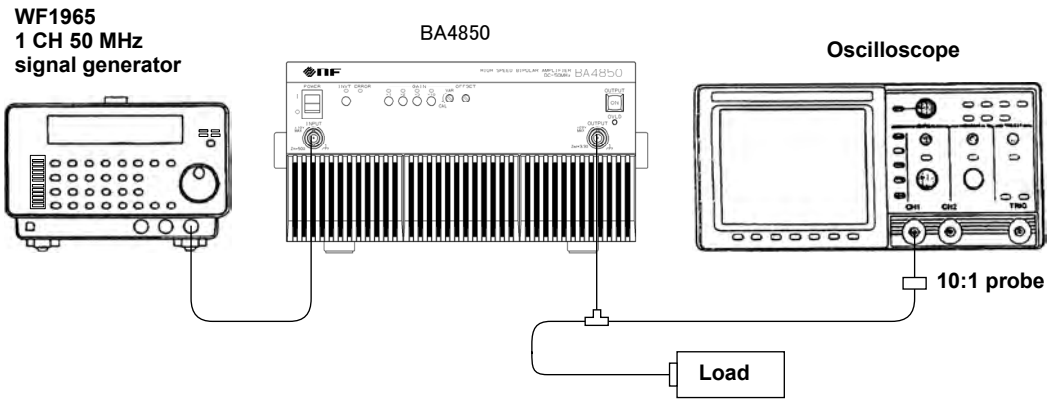


Figure 3-4. Basic Connection Diagram

3.4.1 Signal generator

When using a high frequency of 100 kHz or higher, use a signal generator with an output impedance of 50 Ω and as short a cable as possible.

When the output impedance of a signal generator is not 0 Ω but 50 Ω, for example, the output voltage of the signal generator needs to be set considering the input impedance of the BA4850.

To obtain a necessary input voltage, set the voltage of the signal generator as follows:

$$\left(1 + \frac{\text{Output impedance of signal generator}}{50\ \Omega}\right) \text{ Times}$$

* With WF1965, an output voltage for an arbitrary load impedance (45 Ω to 999 Ω) can be set.

3.4.2 Signal cords

For an input cord, use a BNC cable.

For an output cord, similarly, attach a BNC connector near a load and use a BNC cable.

When a high frequency is used, maximum power may not be supplied to a load because the output voltage of the BA4850 is partly consumed due to the inductance of the wire. If a capacitive load is used, LC resonance can occur with the wire inductance, resulting in ringing. Run a wire along a route as short as possible.

To avoid these effects, the inductance needs to be reduced, taking the length, structure, and material of the wire into consideration.

If a single polyvinyl chloride wire is used, for example, the inductance is about 1 μH/m, and the impedance is about 6.3 Ω at 1 MHz.

3.4.3 Load

Attach a BNC connector near a load, and make a connection by using a BNC cable.

Use a short cable to place a load as close as possible to the BA4850.

3.5 Examples of Basic Operations

3.5.1 Input

Connect the output signal of the signal generator to the input connector through a BNC cable.

⚠ CAUTION

- The BA4850 may be damaged if a voltage beyond the non-destructive maximum input voltage (±11 V) is applied.
  Never apply a voltage beyond ±11 V.
- Avoid putting the input and output cords in close proximity to each other. Doing so may cause ringing or oscillation.

When the output impedance of the signal generator is not 0 Ω but 50 Ω, for example, set the output voltage of the BA4850 by considering the input impedance of the BA4850.

☞ Refer to "**3.4 I/O Connection**".

3.5.2 Output voltage adjustment

A gain in the ×1 to ×30 range can be set by using the gain switch keys (GAIN keys), ×1, ×2, ×5, and ×10, and the control for fine adjustment (VAR) on the front panel.
To obtain a maximum output voltage of ±20 V, the signal generator needs to generate an output voltage of at least ±0.67 V (gain 30 times)

Note that the gain is not switched even if a gain switch key (GAIN key) is pressed again before 1 second elapses after switching the gain. To switch the gain in succession, insert a pause of at least 1 second.

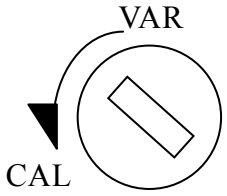


Figure 3-5. CAL Position of Control for Fine Adjustment (VAR)

3.5.3 Fine output offset adjustment

If trouble occurs because a direct current component is superimposed on the signal due to inductance, make a fine adjustment to set the offset voltage included in the output signal of the BA4850 to zero. Use the following procedure for fine offset voltage adjustment:

1. The output offset voltage varies depending on the gain setting, so set an output gain firstly.
2. Connect the signal generator to the input connector and then turn on the signal generator.
3. Connect a DC voltmeter (such as a digital voltmeter) to the output connector.
4. Adjust the DC output voltage to zero by using the potentiometer (OFFSET on the front panel) for fine offset tuning.

Perform fine output offset adjustment after setting the output on/off switch (OUTPUT) to ON.
Before performing fine offset adjustment, wait for 30 minutes to 1 hour until the initial drift is stabilized after power-on.

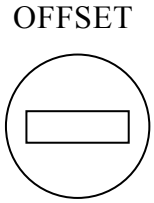


Figure 3-6. Center Position of Offset Fine Adjustment

3.5.4 Output polarity switching

The output polarity can be set to be in-phase or reversed-phase by using the output polarity switch key (INVT key) on the front panel.
The LED on the output polarity switch key (INVT key) is turned on when the output polarity is in reversed-phase.
Note that the output polarity is not switched, even if the output polarity switch key (INVT key) is pressed again before 1 second elapses after switching the output polarity. Insert a pause of at least 1 second to switch the output polarity in succession.

3.5.5 Output on/off control

The main output signal can be turned on or off by using the output on/off switch (OUTPUT) on the front panel or external control input. When external control is used, however, the output on/off switch (OUTPUT) can only be set to OFF.

The LED in the output on/off switch (OUTPUT) turns on when output is turned on.

The LED blinks when output is turned off by the protection function of the BA4850.

For protection cancellation, press the output on/off switch (OUTPUT).

When output is turned off, an attempt to turn on output can be accepted only after 2 seconds elapse for safety.

To turn on output again, wait for at least 2 seconds after output is turned off.

A relay contact is used to turn on and off output. To protect the relay circuit, a muting circuit is actuated at the time of output on/off switching, so that the monitor output and output meter indicate zero for a very short period.

When output overcurrent, excessive internal power loss, abnormal internal temperature, or output overvoltage is detected, the protection function activates and the overload LED turns on.

When the overload LED is turned on, output cannot be turned on.

When output overvoltage is detected while output is on, output is turned off.

For other overload factors, output turns off when overload lasts 10 seconds or more.

⚠ CAUTION

A high voltage can occur at the load when output is turned off if a load including an inductance component is connected, so be careful not to change the load current abruptly.

3.6 Setting at Power-on

Initial values for start-up time can be set by using the DIP switch on the rear panel.

"**Table 3-2 List of DIP Switch Settings**" indicates the function of each switch. Refer to each section indicated in the column "Section to be referenced" for setting details.

Table 3-2. List of DIP Switch Settings

<table>
<tr><th>No.</th><th colspan="3">Function</th><th>Section to be referenced</th></tr>
<tr><td rowspan="3">1</td><td colspan="3">Output on/off</td><td rowspan="3">☞ 3.5.5 Output on/off control</td></tr>
<tr><td>DOWN</td><td colspan="2">Output on</td></tr>
<tr><td>UP</td><td colspan="2">Output off</td></tr>
<tr><td rowspan="6">2, 3</td><td colspan="3">Output voltage gain setting</td><td rowspan="6">☞ 3.5.2 Output voltage adjustment</td></tr>
<tr><td>2</td><td>3</td><td>Gain</td></tr>
<tr><td>UP</td><td>UP</td><td>×1</td></tr>
<tr><td>DOWN</td><td>UP</td><td>×2</td></tr>
<tr><td>UP</td><td>DOWN</td><td>×5</td></tr>
<tr><td>DOWN</td><td>DOWN</td><td>×10</td></tr>
<tr><td rowspan="3">4</td><td colspan="3">External control on/off</td><td rowspan="3">☞ 3.3.3 External control I/O</td></tr>
<tr><td>DOWN</td><td colspan="2">External control on</td></tr>
<tr><td>UP</td><td colspan="2">External control off</td></tr>
<tr><td rowspan="3">5</td><td colspan="3">Output polarity inversion on/off</td><td rowspan="3">☞ 3.5.4 Output polarity switching</td></tr>
<tr><td>DOWN</td><td colspan="2">Output polarity inversion on</td></tr>
<tr><td>UP</td><td colspan="2">Output polarity inversion off</td></tr>
</table>

4. ADVANCED OPERATIONS

4.1 Maximum Output Current and Operation Range

The BA4850 has a protection circuit that detects an output current to limit the output current. A maximum output current is determined by this protection circuit. The relationships are shown in "**Figure 4-1 Operation Range**".

In general, if the load is resistive for an AC signal, quadrants I and III make up an operation range. If the load is capacitive or inductive, all quadrants make up an operation range.
If the load involves an electromotive force with a DC signal, and an operation is performed to supply current from the load, quadrants II and IV make up an operation range.

Output impedance of the BA4850 is 3.3 Ω +0.01 μH (typ.). Gain of the BA4850 is set with no load, so the actual output voltage varies depending on the load impedance. For example, when input and gain are 2 VDC and ×10 respectively, output of 20 V results with no load, while, with load, voltage applied to the load is decreased by the amount of drop for output impedance. When using a 50 Ω load, impedance is 50+3.3 Ω for 20 V output. Output voltage (applied to the load) thus becomes 20 V × 50 Ω/(50+3.3 Ω) = approximately 18.8 V. When using a 50 Ω load, current with the 20 V output is 0.4 A. This is within the range shown in "**Figure 4-1 Operation Range**", so raising the input signal permits on output of 20 V. (The input signal should be within ±10 V of the maximum input voltage.) For AC, especially when using a frequency in the MHz range or greater, effects of 0.01 μH output impedance or cable impedance increases, output voltage thus tends to become lower.
For square wave input, when waveform rise/fall is fast even if a lower frequency (period) is used, the output current protection range may be reached by a charge current for a load capacitance, output cable capacitance, or floating capacitance inside the BA4850, resulting in overload. In this case, decrease output voltage or slow the waveform rise/fall by using a signal generator (e.g. WF1965) that is capable of controlling waveform rise/fall.

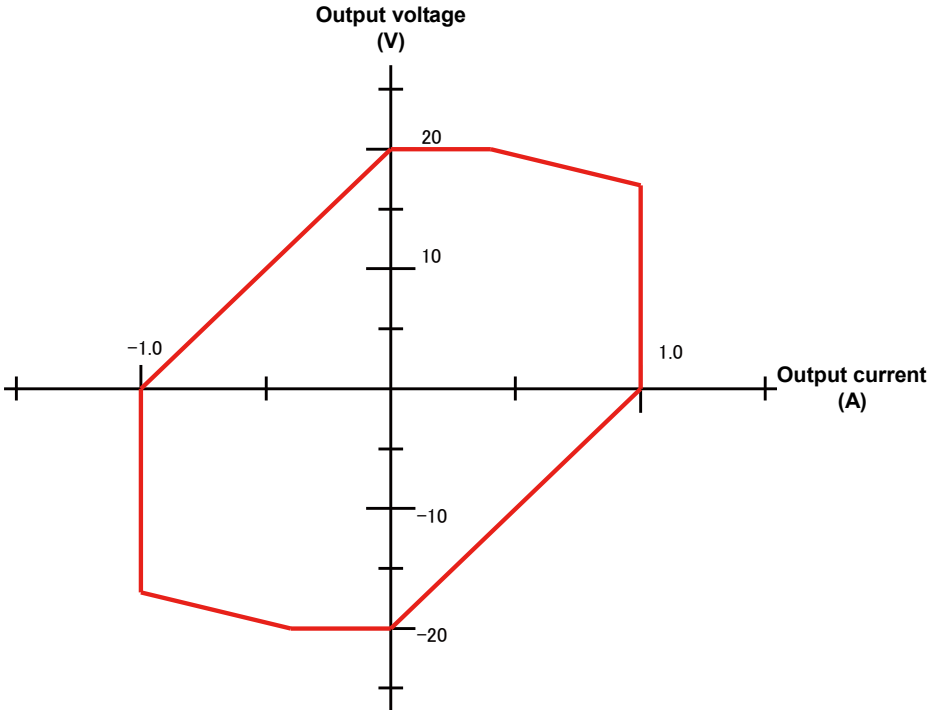


Figure 4-1. Operation Range

4.2 Increasing of Output

The output voltage and output power can be doubled by using two BA4850 units. The output current remains unchanged from the current output when one BA4850 unit is used. Be sure to use the same type of high-speed bipolar amplifier. Moreover, use a frequency of 100 kHz or lower.

As shown in "**Figure 4-2 Connection of Two BA4850 Units**", divide the output of a signal generator with a distributor called a power divider or power splitter, or a T-type divider for connection to the input connector of each BA4850 unit. Note that input voltage is also divided.

Set the output polarity switch key (INVT key) on one BA4850 unit to INVT so that the output phase is opposite to that of the other BA4850 unit. Set the same gain on both BA4850 units. Two oscillators capable of synchronization with other oscillators can be used, as well as a 2-ch device capable of outputting a synchronized signal. In this case, a reversed-phase can be set at the oscillator side by setting the two BA4850 units to be the same.

Connect a load between the outputs of the two BA4850 units as shown in "**Figure 4-2 Connection of Two BA4850 Units**". In both cases, the connection terminal of a load cannot be connected to the BA4850 and the housing of the signal generator. When a load is used in this mode of connection, the load must therefore be insulated from the ground potential and signal source.

⚠ CAUTION

Insulate the load from the ground potential and signal source.

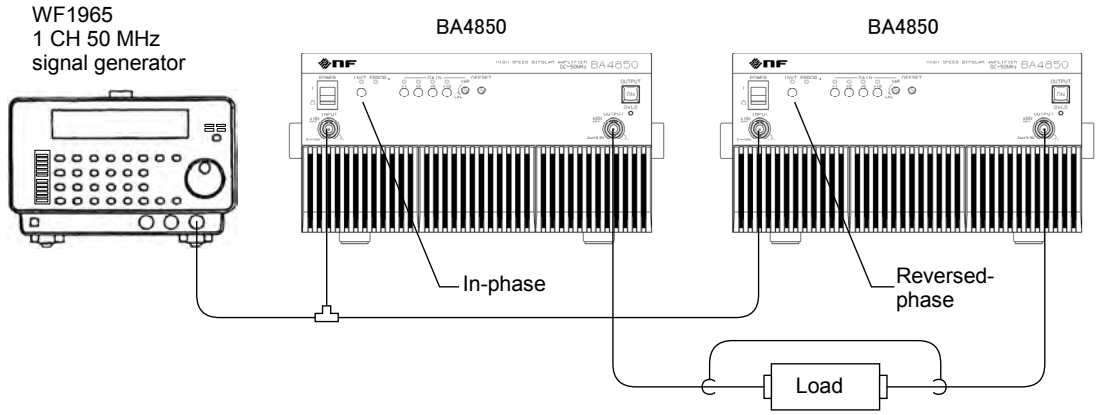


Figure 4-2. Connection of Two BA4850 Units

5. TROUBLESHOOTING

5.1 Error Messages

Self-diagnosis is performed when the power is turned on. If an error is detected, the error state is set. The error state is also set when a wrong operation is performed.

Errors and their causes are described below, together with required actions.

5.1.1 Errors at Power-on

The BA4850 performs self-diagnosis when the power is turned on.

If an abnormality is found, contact NF Corporation or its representative.

Table 5-1. Diagnosis Performed at Power-on

Diagnosis item	Description
LED glow check	Visually check that all LEDs glow for about 1 second. At this time, however, the following LEDs do not glow on: • Output on/off switch (OUTPUT)
ROM sum check	Check whether the ROM is normal. If an abnormality is detected, the BA4850 cannot be operated.

5.1.2 Errors related to the protection function

The errors related to the protection function are shown below.

Contact NF Corporation or its representative if an abnormality is found.

Table 5-2. Errors Related to Protection Function (1/2)

State	Cause	Description
Overload	Output exceeded the allowable output voltage/current range of the BA4850.	The overload LED (OVLD) is on. Output cannot be turned on in the overload state.
		If the overload state lasts for 10 seconds, output is turned off and the LED in the output on/off switch (OUTPUT) then blinks. The overload state can be reset by pressing the output on/off switch.
		If the overload state lasts for 60 seconds, a transition is made to sleep operation, and the overload LED (OVLD) blinks. The BA4850 cannot be operated in sleep operation, so turn off the power. If the overload LED (OVLD) is on even when the input signal, bias, and output are off, the BA4850 may have failed.
Abnormal temperature	The internal temperature is abnormally high.	The overload LED (OVLD) is on. Output cannot be turned on when the temperature is abnormal.
		Output is turned off if the abnormal temperature state lasts for 10 seconds. The LED in the output on/off switch (OUTPUT) blinks at this time. The abnormal temperature state can be reset by pressing the output on/off switch.
		If the abnormal temperature state lasts for 60 seconds, a transition is made to sleep operation, and the overload LED (OVLD) blinks. The BA4850 cannot be operated in sleep operation, so turn off the power. If the overload LED (OVLD) is on even when the input signal, bias, and output are off, and the ambient temperature satisfies the specification, the BA4850 may have failed.

Table 5-3. Errors Related to Protection Function (2/2)

State	Cause	Description
Abnormal output voltage	Output voltage or voltage applied to the output terminal is an overvoltage.	The overload LED (OVLD) is on. Output cannot be turned on when the output voltage is abnormal. Output is turned off immediately if an abnormal output voltage is detected when output is turned on. The LED in the output on/off switch (OUTPUT) blinks at this time.
		A transition is made to sleep operation, and the overload LED (OVLD) blinks if the abnormal output voltage state lasts for 60 seconds. The BA4850 cannot be operated in sleep operation, so turn off the power. If the overload LED (OVLD) is on even when the input signal, bias, and output are off, the BA4850 may have failed.
Internal power supply abnormality	Voltage of amplifier DC power supply (internal power supply) is lower than specification.	The internal power supply error LED (ERR) blinks. At power-on, blinking stops after approximately 3 seconds. Operations other than power-off are disabled while the ERR LED is blinking. Turn off the power, and then turn it on again. If the ERR LED keeps blinking, the BA4850 may have failed.

5.2 When Fault Symptoms Are Observed

When a fault symptom shown below is observed, perform the corresponding action required. Contact NF Corporation or its representative if the symptom cannot be corrected.

Table 5-4. When Fault Symptoms Are Observed (1/2)

Symptom	Possible cause	Action required
The BA4850 does not operate when the power switch is turned on.	The BA4850 is not connected to a live power.	Securely connect the power cord to a live power outlet and to the inlet of the BA4850.
There is no output.	Signal not connected.	Connect the signal generator to the input connector, and then turn on the signal generator output.
	The output on/off switch (OUTPUT) is not set to ON.	Set the output on/off switch to ON.
	The output on/off switch (OUTPUT) cannot be set to ON.	Output cannot be turned off when the overload LED (OVLD) is turned on. Release the condition for turning on the overload LED referring to the required action shown in "**Table 5-2 Errors Related to Protection Function (1/2)**" for a case where the overload LED (OVLD) is turned on. When the overload LED (OVLD) is blinking, all key operations are disabled. Turn off the power switch. Release the condition for blinking the overload LED then turn on the power switch referring to the required action shown in "**Table 5-2 Errors Related to Protection Function (1/2)**" for a case where the overload LED (OVLD) blinks.

Table 5-5. When Fault Symptoms Are Observed (2/2)

Symptom	Possible cause	Action required
The overload LED (OVLD) is on.	An overload is imposed.	If the overload LED is turned off by removing the load, connect a load within the maximum allowable output range or reduce the output level.
	The signal level of the signal generator is excessively high.	Lower the level of the connected signal generator.
	An incorrect gain setting is made.	Set a proper gain by using a gain switch key (GAIN key).
	The ambient temperature is high.	When using the BA4850, ensure that the ambient temperature is 40°C or below.
	The air filters are clogged.	Referring to "**6.2 Daily Maintenance**", clean the air filters.
	There is an obstacle to air circulation near the front panel air inlet or rear panel air outlet.	Install the BA4850 to satisfy the installation conditions described in "**2.2 Setup and Installation**".
	A voltage beyond the maximum allowable output is output.	The input signal level may be too high. Lower the input signal level.
Direct current is output.	A direct current is superimposed onto the signal source.	Adjust the DC component of the signal generator to zero.
The output on/off switch (OUTPUT) blinks and output is turned off even when the overload LED (OVLD) is not turned on.	The BA4850 has turned off output since the overload state has lasted for 10 seconds or more,.	An overload is imposed. Connect a load within the maximum allowable output range or reduce the output level.
	Protection against abnormal output voltage has been actuated.	Overcurrent protection may be actuated when an inductive load is connected, resulting in overvoltage output. Finely adjust the output offset voltage to zero, referring to "**3.5.3 Fine output offset adjustment**".
The voltage waveform is deformed even when the overload LED is turned off.	AC peak current protection is actuated.	When using a frequency of 1 MHz or more, operation of the protective circuit sometimes cannot be detected. Adjust the load or input signal level by referring to the descriptions for when the overload LED (OVLD) is on.

6. MAINTENANCE

6.1 Introduction

This chapter describes the following:

- Notes on long-term storage and the method of storage
- Notes on transportation and repacking for transportation
- Performance test required, for example, for preventive maintenance, acceptance testing, and performance confirmation after repair

See section "**0 Simplified Operation** Check" for simplified operation checking.
Contact NF Corporation for calibration or repair if an operation check or performance test cannot be made successfully.

6.2 Daily Maintenance

- When the panel or case surface is soiled

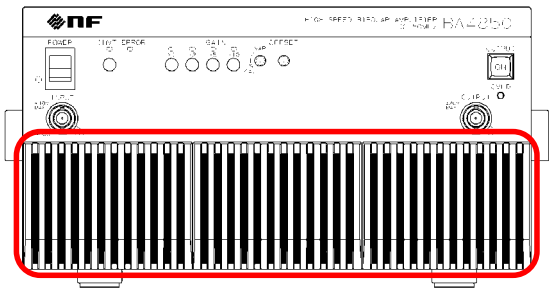
  Wipe off stains with a soft cloth. Wipe resistant stains with a cloth that has been soaked in a neutral detergent solution and then wrung well.

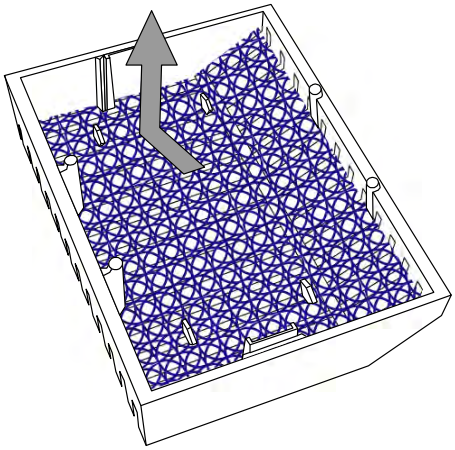
  Do not use a volatile solvent such as a thinner or benzene, or a chemical wipe, which may degrade the material quality or remove the paint.

- When the air filters of the fan are dirty

  The air intake vent on the front panel has three air filters for removing dust and dirt from input air. Dust and dirt adhering to the filters, if not removed, can clog the filters and reduce the air flow, causing the temperature inside the BA4850 to rise and lowering its reliability. Periodically check the air filters for dust and dirt. Clean the air filters monthly, in general, when a fine buildup of dust or dirt is observed on the filters.

  If the air filters are dirty, remove the dust and dirt from the filters by washing them in water and reinstall the filters after completely drying them.





(1) Push the right or left end of the intake vent on the front panel horizontally.
(2) The hooks of the intake vent are disengaged from the main unit, so hold the left and right ends of the intake vent and pull it entirely toward you until it comes off the main unit.
(3) Remove an air filter from the rear side of the intake vent and clean the filter.
(4) Clean the other air filters, using the same procedure.
(5) When the air filters have dried completely, reinstall the intake vent by reversing steps (1) through (3).

Figure 6-1. Air Filter Cleaning Procedure

The air filters will not function normally if the filters are soiled by very fine dust (fine powder) or clogged. Do not install the BA4850 in a place where the BA4850 is exposed to much dirt and dust (including fine powder) or the humidity is high and condensation can easily occur.

6.3 Storage, Repacking, and Transportation

- Long-term storage
  - Disconnect the power cord from the power outlet and the main unit.
  - Store the BA4850 in a place, e.g., on a shelf or rack, so that no object will fall on the BA4850 and the BA4850 will not be exposed to dust.
    If the BA4850 may be exposed to dust, place a cloth or polyethylene cover on the BA4850.
  - The environment conditions allowable for storage are: –10°C to +50°C and 5% to 95% RH. Avoid placing the BA4850 in a place that experiences steep temperature changes and is exposed to direct sunlight, and store the BA4850 at room temperature whenever possible.

- Repacking and transportation

  Note the following when repacking the BA4850 for transportation or repair:

  - Enclose the main unit with a polyethylene envelope or sheet.
  - Prepare a corrugated cardboard box that can sufficiently withstand the weight of the main unit and is large enough.
  - When repacking the BA4850, insert cushioning materials to protect the six faces of the main unit.
  - When asking a carrier to transport the BA4850, notify the carrier that the BA4850 is a precision device.
  - Be sure to include the instruction manual at transportation.

6.4 Performance Testing

Performance testing is conducted as part of preventive maintenance to prevent performance degradation of the BA4850. Performance testing is also conducted as part of acceptance inspection, periodic inspection, performance verification after repair, and so forth.
If the result of a performance testing does not meet the specifications, calibration or repair is required.

⚠ WARNING

This product contains high-voltage parts. Never remove the cover.
All internal inspections of this product are to be performed only by service engineers qualified by NF Corporation.

- The following measuring instruments are used for performance testing.

Measuring instrument	Major performance	Recommendation
Signal generator	40 Hz to 50 MHz, DC Sine wave, 20 Vp-p	WF1965 of NF Corporation
AC voltmeter	10 kHz to 50 MHz, 1 mV to 20 V	9231+952063of BOONTON
DC voltmeter	0 to ±300 V	
Frequency characteristics analyzer	10 Hz to 15 MHz	FRA5097 of NF Corporation
Oscilloscope	DC to 600 MHz	
Audio analyzer	40 Hz to 100 kHz, 0.1%FS	VP-7723D of Levear
Terminating resistor	50 Ω ±1%/allowing continuous application of 10 W, and 12 Ω ±5%/allowing continuous application of 15 W	

⚠ CAUTION

- As a terminating resistor (50 Ω), use a pure resistor with a minimum parallel capacitance and inductance component in the DC to 50 MHz range.
- For output wiring, use a BNC cable of 50 Ω not exceeding a total length of 50 cm.
- Be sure to use a 10:1 probe when connecting an oscilloscope.
- Avoid putting the input and output cords in close proximity to each other. Doing so may cause ringing or oscillation.

- Check the items shown below before conducting a performance testing.
  ☞ See "**3.5.3 Fine output offset** " for the method of fine tuning.

  - Check that the supply voltage range is 90 V AC to 250 V AC.
  - Check that the ambient temperature is within the range 5°C to 35°C, and the ambient humidity is within the range 5% to 85% RH.
  - Check that there is no condensation.
  - Check that 30 minutes or more has elapsed after the power has been turned on.

6.4.1 Measurement of maximum output voltage

- Connection

  Connect a signal generator, AC voltmeter, oscilloscope, and terminating resistor as shown in "**Figure 6-2 Measurement of Maximum Output Voltage**".

- Setting

  Set the BA4850 as follows:

Item	Setting
Polarity switching (INVERT)	OFF
Gain setting	×10 (CAL)
Terminating resistor	50 Ω

- Test procedure

  <1> Set the waveform of the signal generator to sine wave, and set the frequencies shown in "**Table 6-1 Judgment of BA4850 Performance**".

  <2> Set the output on/off switch of the BA4850 to ON.

  <3> Increase the output voltage of the signal generator gradually from 0 V.

  <4> Observe the waveform on the oscilloscope. Record the output voltage value when the waveform begins to be distorted or the overload LED (OVLD) begins to be glow.

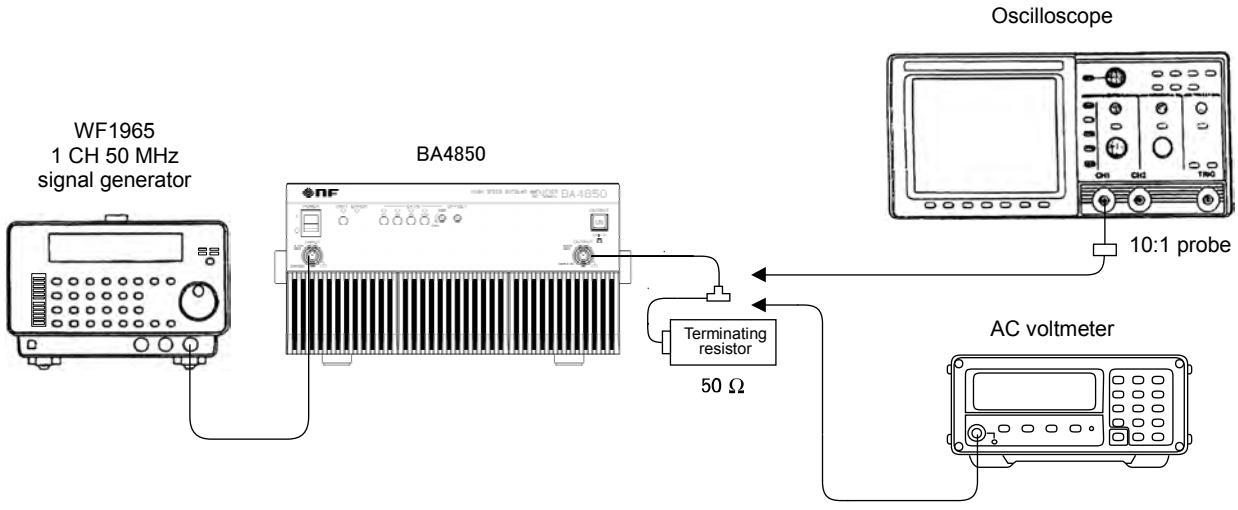


Figure 6-2. Measurement of Maximum Output Voltage

6.4.2 Measurement of maximum output current

- Connection

  Connect a signal generator, DC voltmeter, and terminating resistor as shown in "**Figure 6-3 Measurement of Maximum Output Current**".

- Setting

  Set the BA4850 as follows:

Item	Setting
Polarity switching (INVERT)	OFF
Gain setting	×10 (CAL)
Terminating resistor	12 Ω

- Test procedure

  <1> Set output of the signal generator to DC while setting AC output to zero.

  <2> Set the output on/off switch of the BA4850 to ON.

  <3> Gradually increase the output voltage of the signal generator.

  <4> Record the output voltage value immediately before the overload LED (OVLD) lights. A maximum output power value is obtained by conversion according to the formula (output voltage) ÷ (terminating resistor value).

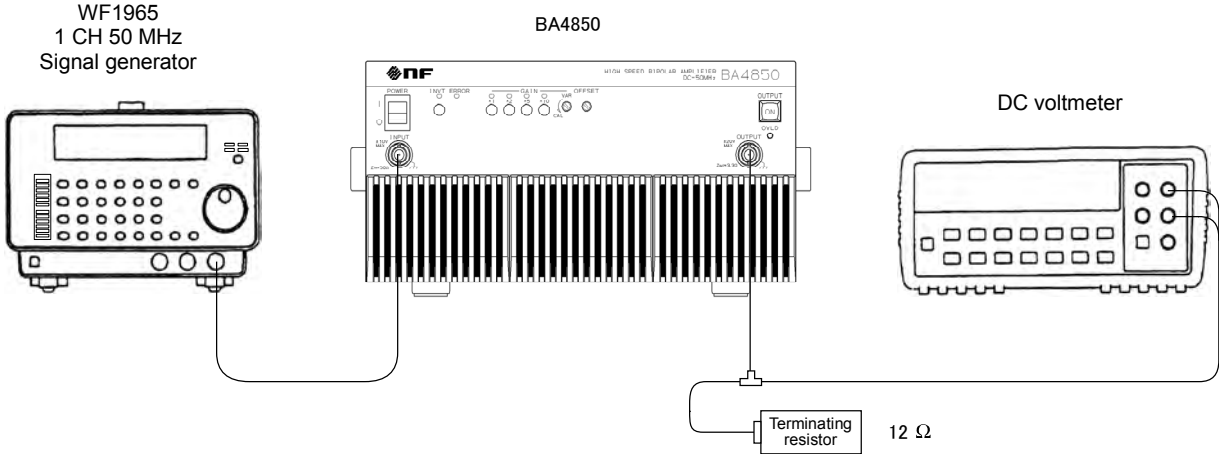


Figure 6-3. Measurement of Maximum Output Current

6.4.3 Measurement of frequency characteristics

- Connection

  Connect an FRA5097 frequency response analyzer (FRA) and terminating resistor as shown in "**Figure 6-4 Measurement of Frequency Characteristics**".

- Setting

  Set the BA4850 as follows:

Item	Setting
Polarity switching (INVERT)	OFF
Gain setting	×10 (CAL)
Terminating resistor	50 Ω

  Set the FRA as follows:

Item	Setting
Output	Sine wave 0.85 Vpk
Sweep frequency	100 Hz to 15 MHz, log sweep
Analysis	ch1/OSC
Indication	logF−logR−θ

- Test procedure

  <1> Turn on FRA output.

  <2> Perform UP (or DOWN) sweep operation for measurement at 100 Hz to 15 MHz.

  <3> Move the cursor after measurement to read the gains at 1 kHz, 100 kHz, 1 MHz, and 10 MHz.

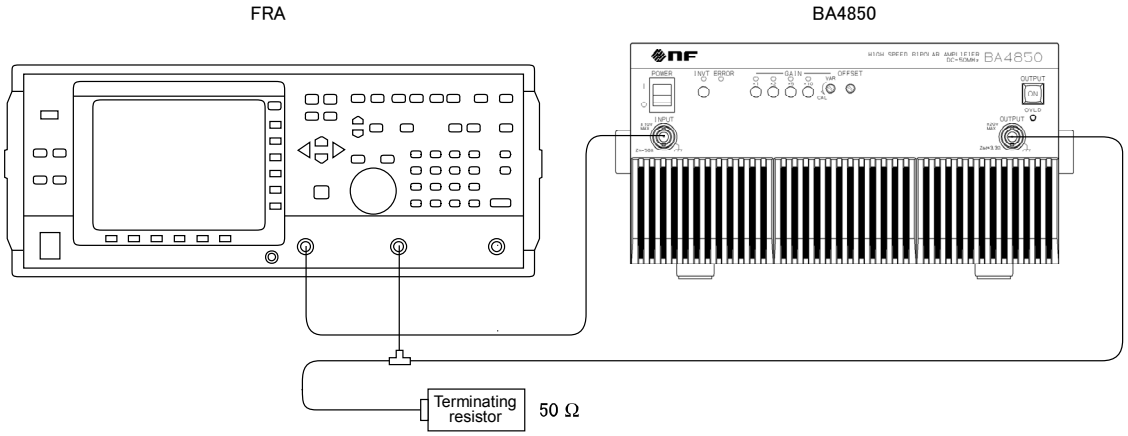


Figure 6-4. Measurement of Frequency Characteristics

6.4.4 Measurement of gain error

- Connection

  Connect an FRA as shown in "**Figure 6-4 Measurement of Frequency Characteristics**".

- Setting

  Set the BA4850 as follows:

Item	Setting
Polarity switching (INVERT)	OFF
Gain setting	×10 (CAL)
Terminating resistor	None

  Set the FRA as follows:

Item	Setting
Output	Sine wave
Frequency	1 kHz
Analysis	ch1/OSC
Indication	logF–R–θ

- Test procedure

  <1> Set the gain of the BA4850 and the output voltage of the FRA as shown in "**Table 6-1 Judgment of BA4850 Performance**".

  <2> Turn on FRA output.

  <3> Make a measurement in the continuous mode.

6.4.5 Measurement of sine wave distortion factor

- Connection

  Connect an audio analyzer and terminating resistor as shown in "**Figure 6-5 Measurement of Sine Wave Distortion Factor**".

- Setting

  Set the BA4850 as follows:

Item	Setting
Polarity switching (INVERT)	OFF
Gain setting	×10 (CAL)
Terminating resistor	50 Ω

- Test procedure

  <1> Adjust the output level of the audio analyzer so that the output voltage of the BA4850 is ±20 Vpk (14.14 Vrms).

  <2> Measure the sine wave distortion factors at frequencies of 40 Hz, 1 kHz, and 100 kHz.

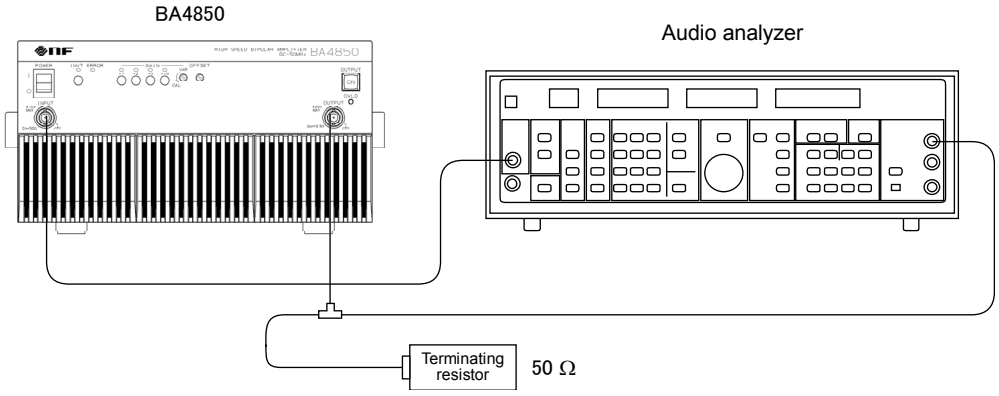


Figure 6-5. Measurement of Sine Wave Distortion Factor

The performance of the BA4850 is normal if the following criteria are satisfied:

Table 6-1. Judgment of BA4850 Performance

	Set frequency	Criterion	Measured value	Judgment
Measurement of maximum output voltage (at 40 Hz, 1 kHz, 1 MHz, and 50 MHz)	40 Hz	±20 V (14.14 Vrms) or more	_ _._ _	Pass/Fail
	1 kHz	±20 V (14.14 Vrms) or more	_ _._ _	Pass/Fail
	1 MHz	±20 V (14.14 Vrms) or more	_ _._ _	Pass/Fail
	50 MHz	±14.2 V (10.04 Vrms) or more	_ _._ _	Pass/Fail

	Frequency	Terminating resistor	Criterion	Measured value	Judgment
Measurement of maximum output current [Voltage immediately before the overload LED (OVLD) is turned on]	DC	12 Ω	12 V or more	_ _ _._	Pass/Fail

	Set frequency	Criterion	Measured value	Judgment
Measurement of frequency characteristics (at 100 kHz, 1 MHz, and 10 MHz with the value at 1 kHz used as a reference (0 dB))	1 kHz	0 dB (reference)	0 . 00	Used as reference
	100 kHz	–0.5 to +0.5 dB	_ _._ _	Pass/Fail
	1 MHz	–3.0 to +1.0 dB	_ _._ _	Pass/Fail
	10 MHz	–3.0 to +1.0 dB	_ _._ _	Pass/Fail

	Gain setting	FRA output voltage	Criterion	Measured value	Judgment
Measurement of gain error At Gain ×1 (CAL), ×2 (CAL), ×5 (CAL), ×10 (CAL)	×1 (CAL)	10 Vpk	0.95 to 1.05	_ _._ _	Pass/Fail
	×2 (CAL)	10 Vpk	1.90 to 2.10	_ _._ _	Pass/Fail
	×5 (CAL)	8 Vpk	4.75 to 5.25	_ _._ _	Pass/Fail
	×10 (CAL)	4 Vpk	9.50 to 10.5	_ _._ _	Pass/Fail

	Set frequency	Criterion	Measured value	Judgment
Measurement of sine wave distortion factor (at each frequency)	40 Hz	0 to 1.0%	_._ _ _	Pass/Fail
	1 kHz	0 to 1.0%	_._ _ _	Pass/Fail
	100 kHz	0 to 1.0%	_._ _ _	Pass/Fail

7. SPECIFICATIONS

Values that indicate accuracy are guaranteed values, but values that do not indicate accuracy are nominal or typical (typ.) values.

Unless otherwise noted, the following conditions are adopted:

Power input:	100 V AC, 50 Hz
Input frequency:	1 kHz
Input waveform:	Sine wave
Gain setting:	×10 (Gain adjustment: CAL)
Output voltage:	±20 V
Output polarity:	In-phase
Load:	Resistance 50 Ω (power factor 1, nominal value)

7.1 Input

■ Maximum input voltage

±10 V

■ Non-destructive maximum input voltage

±11 V

■ Input impedance

50 Ω (Unbalance)

■ Input terminal

BNC connector (front panel)

The Lo side is connected to the housing.

7.2 Output

■ Operation mode

Constant voltage (CV)

■ Output polarity

In-phase or reversed-phase (switchable with the switch on the panel)

■ Gain setting function

Fixed: ×1, ×2, ×5, ×10

Variable: ×1 (CAL) to ×3 continuous

A set gain is (fixed) × (variable).

■ Gain error

±5% (Gain adjustment: CAL, at 1 kHz, without load)

■ Maximum output voltage

±20 V	DC to 20 MHz
±14.2 V	20 MHz to 50 MHz

■ Maximum output current

±1 A	DC

■ Output voltage and current ranges

☞ See "**Figure 7-1 Output Voltage/Current Range (DC)**".

■ Small-amplitude frequency characteristics

Condition: Output amplitude ±4 V, 1 kHz used as a reference

DC to 100 kHz	±0.5 dB
100 kHz to 50 MHz	+1, –3 dB

■ Rise/fall time

10 ns or less (10 to 90% change, input square wave, output 8 Vp-p)

■ Slew rate

6000 V/μs or more

■ Output DC offset

Adjustable range:	±0.5 V or more (input terminal shorted)
Temperature drift:	Within ±5 mV/°C (typ.)

■ Harmonic distortion factor

1% or less (10 Hz to 100 kHz)

■ Spurious

–30 dBc or less (100 kHz to 500 kHz)

–25 dBc or less (500 kHz to 50 MHz)

■ Output noise

Condition: Input terminal shorted, measurement band 10 Hz to 1 MHz

14 mVrms or less

■ Output impedance

3.3 Ω +0.01 μH or less (typ.)

■ Output terminal

BNC connector (front panel)

The Lo side is connected to the housing.

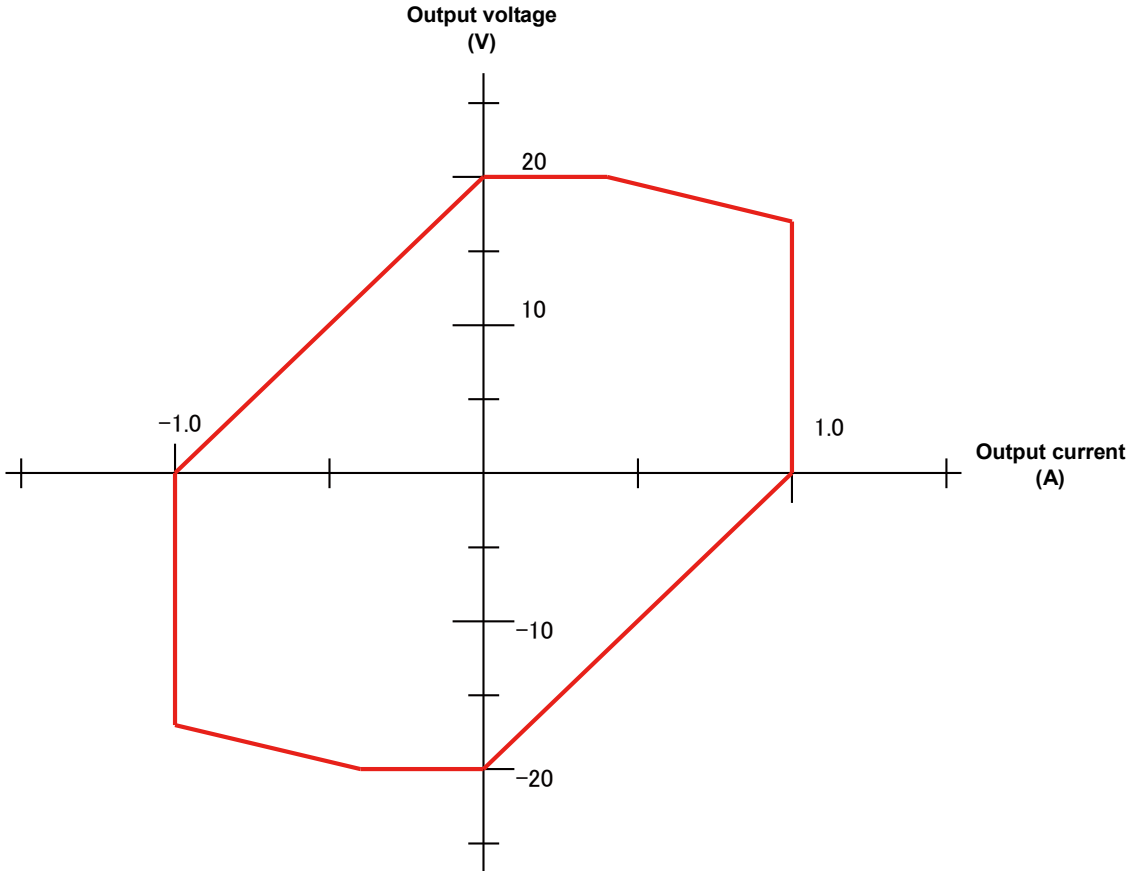


Figure 7-1. Output Voltage/Current Range (DC)

7.3 Protection Function

■ Output overload

When an excessive output current or an excessive internal power loss is detected, the output current is clipped and the overload LED on the front panel is lit. Output turns off if the overload state lasts for 10 seconds or more. If the overload state lasts for 60 seconds, a transition is made to sleep operation.

■ Output overvoltage

Output turns off when an abnormality is detected. If the output overvoltage state lasts for 60 seconds, a transition is made to sleep operation.

■ Power supply section abnormality

When an abnormality is detected, the internal power supply error LED (ERR) blinks, output turns off, and a transition is made to sleep operation.

■ Abnormal internal temperature

When an abnormality is detected, the overload LED on the front panel is turned on. If the abnormal temperature state lasts for 10 seconds, output turns off. If the state lasts for 60 seconds, a transition is made to sleep operation.

* Sleep operation: All the operations except power-off are disabled.

7.4 External Control I/O

■ Control input

Input level:	Hi (1): +4.0 V or more
	Lo (0): +1.0 V or less
Maximum non-destructive input:	+6 V/–5 V
Input impedance:	Photocoupler LED input (250 Ω in series)
Control item:	Output on/off (0: Off, 1: On)

■ State output

Output mode:	Open collector output (housing potential)
Usable voltage and current:	15 V or less, 10 mA or less
State item:	Output on/off (on when a connection is made)
	Overload (overload when a connection is made)

■ Enabling external control

The DIP switch on the rear panel is used (0: Disable, 1: Enable).

■ Terminal

D-sub 9-pin multiconnector (rear panel, female, M2.6 screw)

7.5 Output On/Off Control

Output on/off: Controllable using the switch on the front panel or external control input (When external control is used, the switch on the front panel can be set to OFF only.)

7.6 Setting at Power-on

■ Setting method

The DIP switch on the rear panel is used.

■ Setting items (4 items in total)

- Output on/off
- Gain
- External control on/off
- Output polarity

7.7 Power Input

Voltage range:	100 V AC to 230 V AC ±10% (not exceeding 250 V) Overvoltage Category II
Frequency range:	50 Hz/60 Hz ±2 Hz (single phase)
Power consumption:	200 VA or less
Power factor:	0.95 or more

7.8 Safety and EMC

(Only Models with a CE Marking on the Rear Panel)

■ Safety

Compliant with the following standard requirement

- EN 61010-1:2010
  Pollution Degree 2

■ EMC

Compliant with the following standard requirement

- EN 61326-1:2006 (Group 1, Class A)
- EN 61000-3-2:2006
- EN 61000-3-3:1995 + A1:2001 + A2:2005

* The output may become off if the BA4850 is exposed to a strong radiated radio frequency electromagnetic field.

* This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

7.9 Ambient Temperature Range, Ambient Humidity Range, Etc.

Operating environment:	Indoor use
Altitude:	2000 m or lower
Operation guarantee:	0°C to +40°C/5% to 85% RH The absolute humidity must be within the range 1 to 25 g/m^3, with no condensation.
Performance guarantee:	+5°C to +35°C/5% to 85% RH The absolute humidity must be within the range 1 to 25 g/m^3, with no condensation.
Storage condition:	−10°C to +50°C/5% to 95% RH The absolute humidity must be within the range 1 to 29 g/m^3, with no condensation.

Figure 7-2 shows the ambient temperature and humidity ranges.

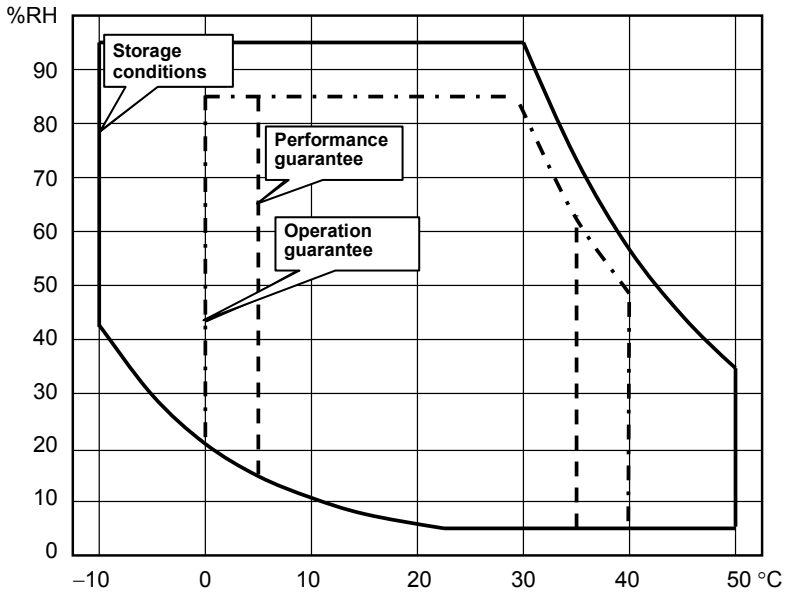


Figure 7-2. Ambient Temperature and Humidity Ranges

7.10 External Dimensions and Weight

■ External dimensions

Width: 258 mm

Height: 132.5 mm

Depth: 390 mm

(Projections are not included.)

■ Weight

About 7 kg

Figure 7-3 shows the external dimensions.

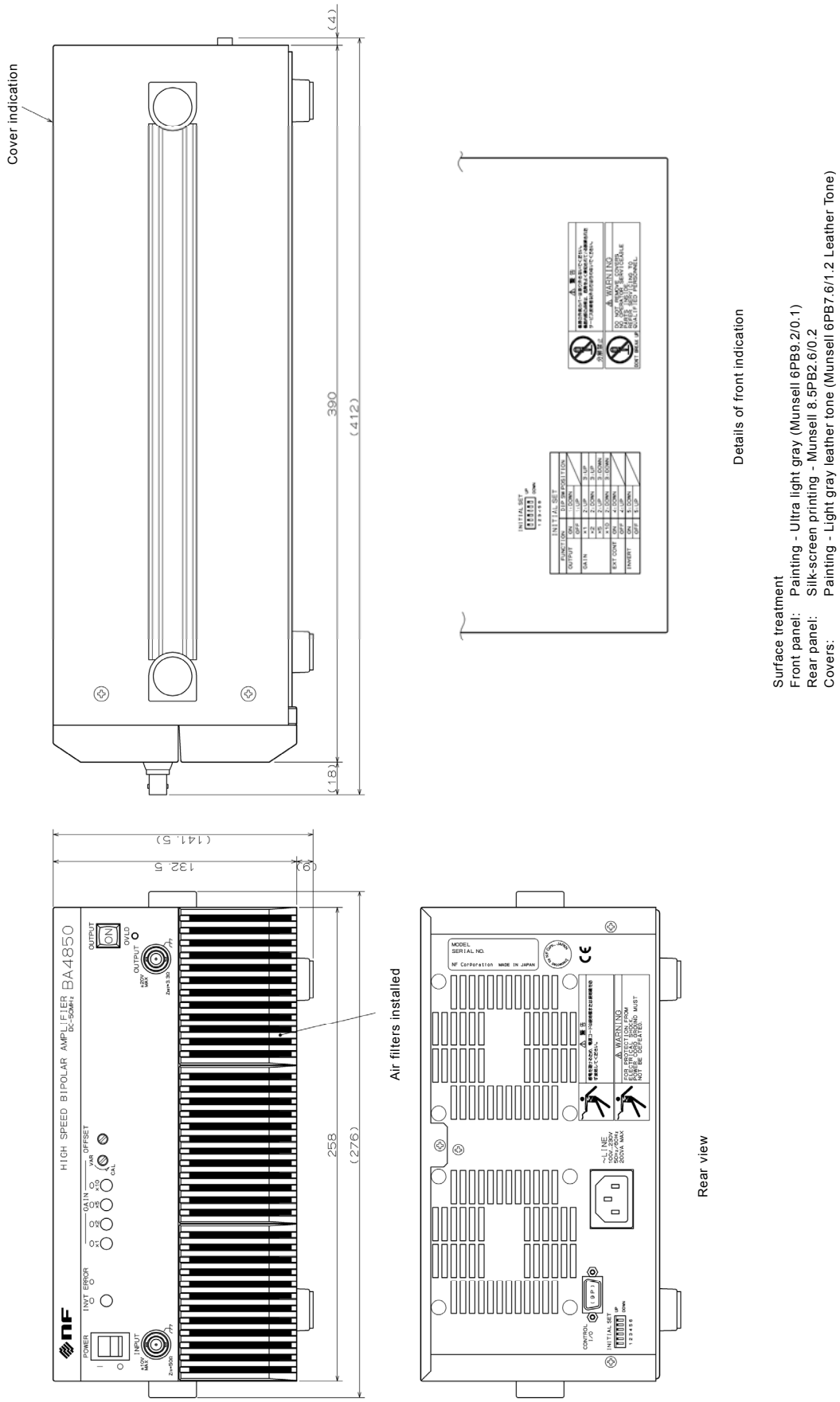


Figure 7-3. External Dimensions

———— WARRANTY ————

NF Corporation certifies that this product was thoroughly tested and inspected and found to meet its published specifications when it was shipped from our factory.

All **NF** products are warranted against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period, **NF** will repair the defective product without any charge for the parts and labor. For repair service under warranty, the product must be returned to **NF** representatives. Purchaser shall prepay all shipping charge, duties and taxes for the product to **NF** representatives from another country, and **NF** shall pay shipping charge for the return of the product to purchaser.

This warranty shall not apply to any defect, failure or damage caused by a) improper use; b) improper or inadequate maintenance and care; or c) modification by purchaser or personnel other than **NF** representatives.

NF Corporation

WABUN: (DA00015615-004)

If there are any misplaced or missing pages, we will replace the manual. Contact the sales representative.

NOTES

- Reproduction of the contents of this manual is forbidden by applicable laws.
- The contents of this manual may be revised without notice.
- Information provided in this manual is intended to be accurate and reliable. However, we assume no responsibility for any damage regarding the contents of this manual.
- We assume no responsibility for influences resulting from the operations in this manual.

BA4850 Instruction Manual

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