V3 PROTECTIVE RELAY TESTER

RX 4718W

INSTRUCTION MANUAL

NF Corporation

DA00014257-002

RX 4718W

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Instruction Manual

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Forward

Thank you so much for procuring RX4718W V3 PROTECTIVE RELAY TESTER. At the outset, please take a few minutes to read the Safety Precautions indicated in this manual in order to use this equipment safely and correctly.

■ Warning and Caution notices

The following Warning and Caution notices appear in this manual. These must be observed in order to protect both the user from physical harm and the equipment from damage.

⚠ Warning

Risk of serious and possible fatal physical injury from electric shock or other cause.

⚠ Caution

Risk of damage to the equipment.

■ Manual composition

Please read Section 1 before using the equipment for the first time.

Section 1. Overview

Describes an outline, features, applications, functions and an outline of the principle of operation of the RX4718W.

Section 2. Preparation

Describes required preparatory work before installing and operating the equipment.

Section 3. Description of panel and basic operation

Describes the functions, operations and basic operations of the dials on the panel. Read while operating the equipment.

Section 4. Practical oparation

Describes further operations.

Section 5. GPIB interface

Describes remote control by the GPIB.

Section 6. RS-232C interface

Describes remote control by the RS-232C.

Section 7. Troubleshooting

Corrective measures when error messages or abnormalities occur.

Section 8. Maintenance

Describes the methods of storage, repacking, transportation and performance test.

Section 9. Specifications

Equipment specifications (functions and performance) are described.

Safety Precautions

Observe the following warnings and cautions in order to use this equipment safely. No responsibility or warranty is assumed for damages arising from use in a manner contrary to these warnings and cautions.

■ Observe text instructions

This manual has been compiled in order to enable safe operation and use of this equipment. Be sure to read this manual before using the equipment.

Items designated by warning advice of serious physical hazards. Be sure to observe them carefully.

■ Be sure to connect to ground

Since the unit includes a built-in line-filter, there is risk of shock if used without grounding.

To prevent getting an electric shock, securely connect the equipment to a ground providing a resistance to ground of 100 ohms or less according to the electrical installation technical standard.

Be sure to properly connect the ground. By connecting the 3-conductor power cable to a grounded 3-terminal wall socket, the equipment is automatically grounded.

When using a 3-pole-to-2-pole conversion adapter, be sure to connect the grounding wire (green) of the conversion adapter to the grounding terminal, or connect the [GND] terminal on the left side panel to the grounding terminal with the wire of $2mm^2$ or greater.

■ Confirm power supply voltage

This equipment operates at a power supply voltage described in “Grounding and power supply connection” in this operation manual.

Before connecting this equipment with power line, check that the proper voltage is being supplied to the wall power outlet.

■ Smoke, odor, noise

In event smoke, peculiar odor or noise is emitted, immediately disconnect the power source and **avoid further operation**.

Whenever such an abnormality occurs, prevent the equipment from being used until it is completely repaired and immediately contact us or our sales agency.

■ Pay special attention when removing covers

This equipment has internal dip switches that allow to prohibit/permit the functions such as “output on all together” and “waveform-switch +DC/-DC”. When these settings need to be changed, the top cover needs to be removed. Note that a dip switch on the top of the PCB only is set up at this time.

⚠ Warning

Disconnect the power cable before removing the top cover.
This equipment contains dangerously high voltages. Do not touch other than the dip switch.

■ Flammable gas

Do not use this equipment in the presence of flammable gas. There is danger of fire and explosion.

■ Do not modify

Do not use parts other than specified by the manufacturer and by no means attempt to modify the equipment.

There is the risk of personnel hazard and damage to the equipment. The manufacturer reserves the option of refusing service in such cases.

■ Safety related symbols and indications

Following are general definitions of the symbols and indications used on the product.

Operation manual reference symbol

This symbol appears on advices of possible hazard to the user, as well as the need to consult this manual when using an operation or function.

Caution
High Voltage

Symbol indicating danager of electric shock

This symbol is posted in places posing danger of electric shock in the particular conditions.

Protective grounding terminal symbol

This symbol appears on a terminal that needs to be grounded to prevent electric shock. Before operating the equipment, be sure to connect this terminal to a ground providing a resistance to ground for 100 ohms or less.

(Connecting the 3 conductor power cable to a 3-terminal wall socket with grounding eliminates the need to ground this grounding terminal.)

■ Other symbol

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

⚠ Warning

This equipment is used to measure characteristics of a protective relay, and is intended to be operated by professional users who are engaged in maintenance work at power stations or substations, etc. and have a thorough understanding of safety. This equipment is therefore designed giving priority to functionality and operability over safety compared to general measuring instruments. When operating, pay special attention to safety to prevent accidents, etc.

Be extremely careful with the following:

- The power input terminal on the left side (AC85V-115V, AC180V-240V) is to be used when the supplied power cable is missing. When using the power input terminal, be extremely careful not to receive electric shock.
- A voltage of a maximum of 250Vrms is output to the voltage output terminal on the front panel. When operating the product, be extremely careful to avoid accidents such as electric shock.

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1. General Description

1.1 Overview

The “RX4718W　V3 Protective Relay Tester” is the test equipment to test protective relays used in the power stations and substations, etc.
The RX4718W is a small, light and multi-function protective relay tester combining a digital direct synthesis type synthesizer, 3-phase constant voltage output amplifier and microcomputer.
Quickly changing or sweeping the output frequency, output amplitude or output phase of a single RX4718W unit makes it possible to measure its operation time (dynamic characteristics) and operation values (static characteristics) of a protective relay.
The RX4718W comes with an RS-232C and GPIB allowing a personal computer to externally control them for automatic measurement of the protective relay.
The power supply voltage is 85V to 115V or 180V to 240V. It also uses a power factor improving circuit as countermeasures against current harmonics, allowing use of the product with low current consumption.
Our protective relay testers include model name that contains two or three alphabets at the beginning of the name such as REX4707A and RX4717W and those 4707A without alphabets. The model, which contains the same 4-digit number and one alphabet following the number, has the same specifications.
The following protective relay testers belong to the same RELAY EXPRESS series that allow connection as master-slave links. They are hereinafter called “this series”.
4707, **4707A**, **REX4707A**, **4708**, **4708A**, **REX4708A**, **4709**, **4709A**, **REX4709A**, **4710**, **4710A**, **REX4710A**, **RX4717W**, **RX4718W**, **4722**, **REX4722**, **REX4723**, **4741**, **REX4741**, **As518**
This series also include the following current output amplifiers even though they don't have control function by master-slave links. **4731, REX4731, As535**

1.2 Features

- Small (JIS rack size), light (19kg)
- 3ch voltage-outputs (range of 40V, 125V, 250V respectively) in a single unit
- A built-in timer allows the single RX4718W unit to measure dynamic characteristics.
- High-accuracy panel display of the output amplitude/phase and set-values allows the single RX4718W unit to measure static characteristics
- A built-in 10Hz to 200 Hz synthesizer allows a single RX4718W unit to measure frequency relays.
- A built-in synthesizer with harmonic generation capability allows a single RX4718W unit to measure harmonic relays.
- Allows operation of Step-Out Relays.
- Master/slave connection is possible with a single cable, facilitating multi-phase implementation.
- 32 settable built-in memories facilitates calling up of set values.
- Standard equipment of the GPIB and RS-232C allows control by a computer.
- Use of a power factor improving circuit for the power supply reduces current harmonics with low current consumption.
- Allows quick change or operation in synchronization with the **4705A**

1.3 Function list

■ Amplifier

Completely isolated (withstand voltage: 500Vrms) 3-phase voltage outputs (3 ranges of 40V, 125V and 250V).

■ Output

Front terminals

Side terminals (3-phase 4-wire connectors for 1L and 2L)

3-phase (1L, 2L), ground fault (voltage 1→1L, voltage 3→2L), short-circuiting (voltage 1→1L, voltage 3→2L)

■ Output On/Off

Individual On/Off

All of output On/Off all together (this function is enabled/disabled by the internal dip switch)

■ Amplifier input signal selection

Internal

External output (in case that the booster is used for the external output signals.)

■ Frequency mode selection

Internal (10.000-200.000Hz), 50Hz fixed, 60Hz fixed, line synchronization, external synchronization

■ Waveform selection

Sine wave, harmonic-1 (up to order 25), arbitrary waveform, +DC/-DC (this function is enabled/disabled by the internal dip switch)

■ Amplitude and phase (normal value, fault value, and for SOR quick change mode***, step 2 value and step 3*** value are set)

Amplitude setting: voltage: 0.000-250.00V

Phase setting: voltage are set as 0 to 359.9 ° respectively (in case of the negative setting for phase is available, -359.9)

■ Master/slave

Separate, master, slave

Operate on/off of communication function of changer (synchronization of the output changer at master or slave).

Trip phase selection (effective when 4741 is master, select the trip phase in total test mode)

■ Operation mode

Manual mode: (quickly changed by the normal and fault instruction key on the front panel. The timer does not operate.)

Quick change mode: (quick change control function and timer function is valid.)

Hold quick change: (simulation of permanent fault, the output of fault value is held after quick change.)

Non-hold quick change: (simulation of arc fault, normal⇔fault are occurred always synchronized with trip signal.)

Simultaneous measurement mode of operation and recovery:
(operation/recovery time is measured simultaneously)

Sweep operation: (total of 9 types: 3 modes of normal, 1LG and 2LS, 3 different sweeps modes are available in each mode)

Sweep: (single sweep, and manual sweep by modify is available.)

Search sweep: (operation points of digital protective relays are measured by plural sweeps.)

DSK search sweep: (operation points of disk protective relays are measured by plural sweeps of the specified number of times.)

95 test mode: (test of frequency relay)

SOR quick change mode: (test of Step-Out Relay)

■ Quick change control function (valid when the operation mode is quick change mode.)

Quick change start phase (quick change occurs at the phase set with respect to internal reference phase).

setting range: 0-359.9°, On/Off of the function is available.

Pre-trigger time (quick change starts after the setting time from quick-change-start-command.)

setting range: 10-6000ms, On/Off of the function is available

Fault duration (forced to normal value after the setting time elapsed from quick change start.)

setting range: 0.001-65.000s, On/Off of the function is available

■ Time function (valid when the operation mode is quick-change mode)

Timer mode

Interval : (measures the time from the start of a quick change to the trip-signal)

One-shot : (measures the operation width of a trip-signal)

Train: (measures the total time of operation width of a trip-signal)

Start measurement: (measures the time from the start signal to the trip-signal)

Timer setting

Timer clear

Auto: (the timer value is automatically cleared when quick change operates.)

Manual: (the timer value is cleared by pressing Clear key.)

Automatic

ON :(return to the normal value by the trip signal.)

OFF :(not return to the normal value by the trip signal. The fault value is retained)

■ Trip input

Logic setting of the trip signal is available.

Chatter removal time setting for the trip signal is available.

setting range: 1-100ms, On/Off of the function is available.

■ Operation start input

Logic setting of the operation start signal is available.

Stop setting (the output is recovered to the normal value with recovery of the operation-start-signal.)

Use/disuse setting of the function is available.

■ Extended external response input

The trip-input can be extended up to 255 channels using the optional expansion box.

■ PSW (**P**ush **SW**itch) mode (function of the fault-command-key of ⑭ on the front panel)

Alternate -------(the fault status is retained once it is pressed),

Momentary---- (fault status when pressed, and normal status when released)

■ Beep sound setting

On/Off

■ Panel-SETTING / DATA memory

Read, write, comment input, readout of 50Hz/60Hz initial value

■ Interface

GPIB, RS-232C

1.4 Principle of operation

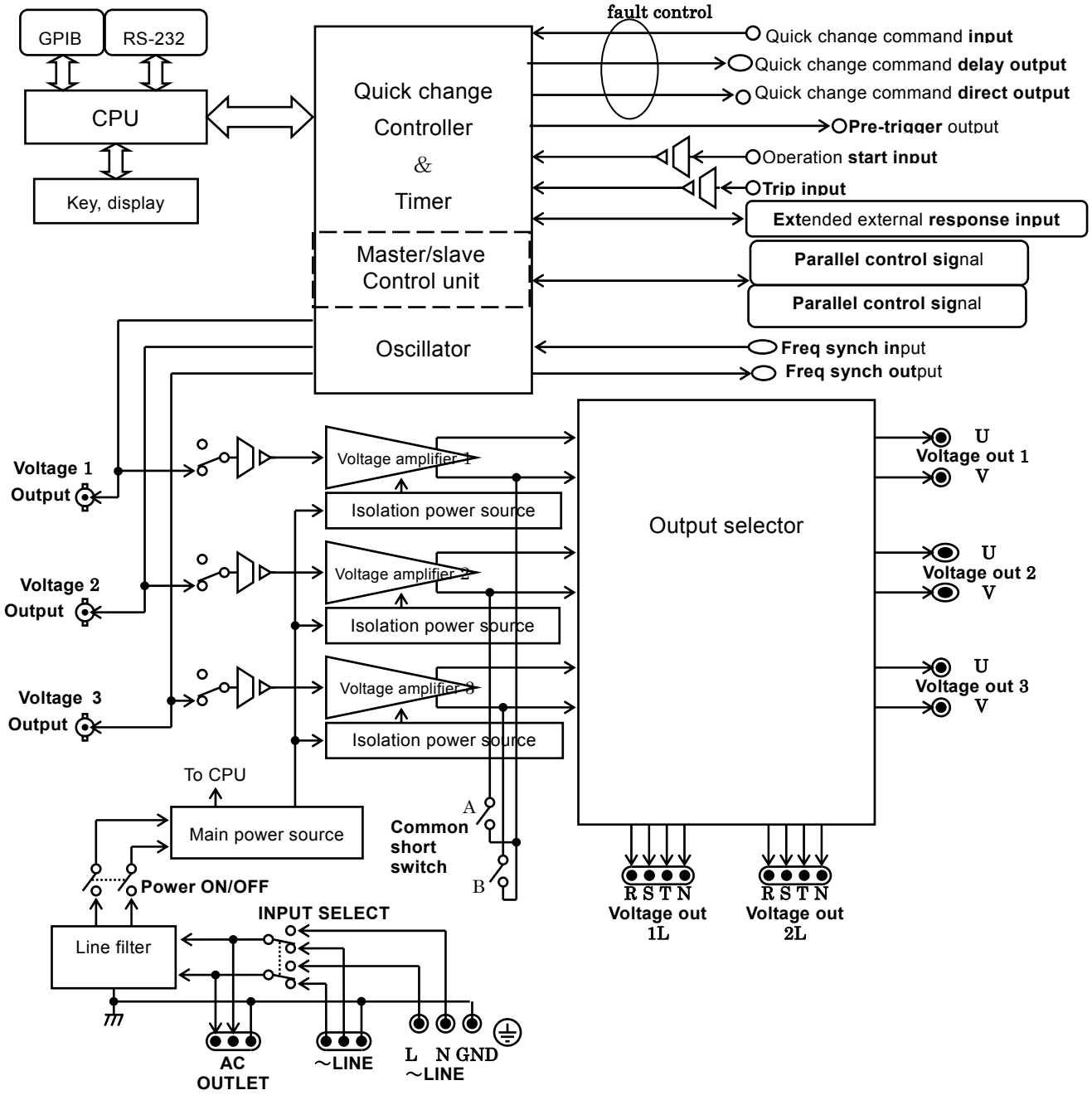


Figure 1-1 Block diagram

■ CPU

CPU controls the overall operation of the RX4718W. In the event of power interruption the RAM retains the content with a battery and the values set at the last shutdown are called up when the power is turned on.

■ Quick change controller and timer

A TRIP INPUT signal and START INPUT signal are isolated and applied into the quick change control where these signals are subjected to normal/fault quick change control.
The timer measures the operation time under the control of the quick change controller.

■ Master/slave control unit

Quick change operation and synchronization of output frequency between the master and slave are controlled.

■ Oscillator

The oscillator uses a digital direct combination type synthesizer (DDS). The DDS allows setting the waveform, amplitude and phase individually, and in the quick change operation the signal waveform with high degree of freedom can be created by the settings.

■ Voltage amplifier

The voltage amplifier output is isolated from line input, enclosure, input signal and each other.

■ Output changer

There are output terminals on the front panel and side panel of the unit.
The voltage amplifier output signals are led to output-terminals that are set by output setter.

■ Main power supply

The main power supply supplies the necessary power to the CPU and isolation power supply of each amplifier. It uses a power factor improving type converter to improve the power factor.

2. Preparation before use

Check before use

■ Safety check

Read the following items in the operation manual before use to secure the safety of users.

- Safety precaution (described in the beginning of this operation manual)
- 2.3 Grounding and power supply

■ Unpacking and repacking

Make sure that there is no damage caused by accidents during transportation.
Check the name and number of accessories listed below before installing the instrument.

Table 2-1 Configuration

Item	Quantity
●RX4718W unit	1
●Operation manual	1
●Accessories	
Power cable (one-end arrow type crimp-style terminal)	1
Power cable (with one-end 100V receptacle)	1
3-pin-to-2-pin conversion adapter	1
Daisy-chain power cable	1
3-phase 4-wire voltage output cable	2
Master/slave daisy-chain control signal cable	1
External signal cable (BNC-banana chip)	3
Accessory cable bag	1

When repacking the equipment for purpose of transportation, make sure to insert the cushioning materials sufficient to support the weight in the box with the appropriate strength and room in order to protect the equipment sufficiently.

2.1 Installation location

■ Installation location

Place the equipment so that four rubber legs of the bottom or the back are secured on the flat surface such as a table.

The weight of each unit is approximately 19kg. Install it on a strong and flat place bearing the total weight.

⚠ Caution

When using two or more of equipment in this series piling one atop another, the structural limit is 4 units or less.

■ Conditions of installation location

- Install where the temperature and humidity meet the following allowable ranges.
  - ・Performance guarantee: +15 to +35℃, 5 to 85%RH (no condensation)
  - ・Operation guarantee : 0 to +40℃, 5 to 85％RH (no condensation)
  - ・Storage condition : -10 to +50℃, 5 to 95％RH (no condensation)
- This equipment uses fans for the cooling.
  - ・The air inlets/outlets are located on the right and left sides.
    Secure a space by at least 10cm from the wall, etc. for ventilation.
  - ・When you notice that the fans are stopped,
    Cut power off immediately and inform us or our distributors. Using the equipment with the fans stopped may worsen the damage to make the repair harder.
- Avoid installing the equipment in the following locations.
  - ・Where excessive noise is included in the commercial power source.
    If excessive noise is included in the commercial power source, noise is superposed on the output signals to make the specification less reliable. Use the commercial power source with less noise.
  - ・Where flammable gas exists.
    The risk of explosion is involved in such places. Never install or use the equipment in such places.
  - ・Outside, where the equipment is exposed to direct sunlight, and near fire or heating sources.
    Installing in such places may deteriorate the performance or cause malfunction of the equipment.
  - ・Where corrosive gas, water, dust, metal powder and salt content exist and the place with high humidity.
    Installing in such places may cause corrosion or malfunction of the equipment.
  - ・Near the source of electromagnetic field, high-voltage equipment, power lines and the source of pulse noise
    Installing in such places may cause malfunction.
  - ・Where vibration frequently occurs
    Installing in such a place may cause mal-operation or malfunction.

2.2 Setting of internal dip switch

This equipment contains the mode that outputs the DC voltage to test the DC relay. It also contains the function enabling to turn on and off the all output-signals at once to improve the operation ability. Such functions can broaden the range of application for this equipment, but some may involve risks depending on the usage and be unnecessary in many cases. Therefore, enabled/disabled setting of these functions can be selected individually by setting the internal switch.

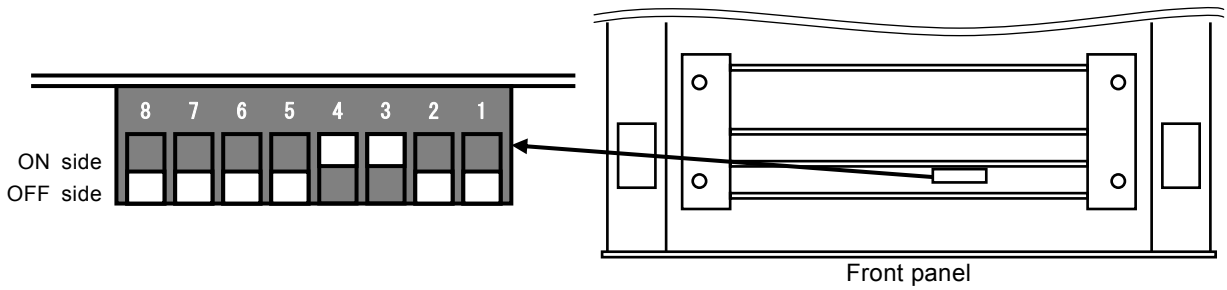
The factory setting is “disable” for DC output and “enable” for output ON/OFF function.

To change this setting, remove the top cover and change the dip switch setting on the top of the PCB indicated below.

⚠ Warning

Be sure to remove the power cable when removing the top cover.
This equipment contains some high-voltage parts. Never touch any other parts except for the dip switch.

The internal dip switch is set as shown below. Change the setting if necessary.



No	Description	Setting detail: *indicates the factory setting.
1	When the equipment is a master, all-output-ON-control-signal is sent to the slave.	ON side : (disable) *OFF side : (enable)
2	All-output-ON-operation of this equipment	ON side : (disable) *OFF side : (enable)
3	Wave select +DC/-DC function	*ON side : (disable) OFF side : (enable)
4	When Amplifier output on/off key is OFF, signal amplitude of external signal output terminal set to "0Vrms"	*ON side : (disable) OFF side : (enable)
5-8	Unused	*OFF

Figure 2-1 Setting of internal dip switch

2.3 Grounding and power supply

■ Grounding

⚠ Warning

Since the unit includes a built-in power line filter, there is risk of electric shock if used without grounding.
To prevent electric shock, securely connect the equipment to a ground providing a resistance to ground of 100 ohms or less according to the electrical installation technical standard.

- When the supplied power cable with 100V receptacle is used, connect the 3-conductor power cable to the grounded 3-terminal wall socket.
  When the 3-pole-to-2-pole conversion adaptor is used for the 3-terminal wall socket, connect the grounding wire (green) of the conversion adapter to the grounding terminal next to the receptacle.
- When the supplied power cable (one-end is arrow type crimping terminal) is used, ground the grounding wire (green).
- Connect the grounding terminal on the left side panel by the wire of 2mm^2 or greater.

■ Power supply

⚠ Caution

Before connecting the power supply, check that the line voltage meets the rated power supply voltage of the equipment.

- The power supply specification of the RX4718W is as shown below.

Voltage	AC85V-115V, AC180V-240V
Frequency	48Hz-62Hz
Maximum electric power consumption	800VA

Use the supplied power cable to supply the power to the equipment. Terminals on the left side are provided for emergency at the site where the equipment is transported and the supplied power cable is not available. Supplying the power to the terminals can operate the RX4718W. When using this terminals, set a slide-switch position to the terminal position.

⚠ Warning

Note that this terminal is for emergency use only.
Since there is danger of causing electric shock, etc., avoid using this terminal all the time.

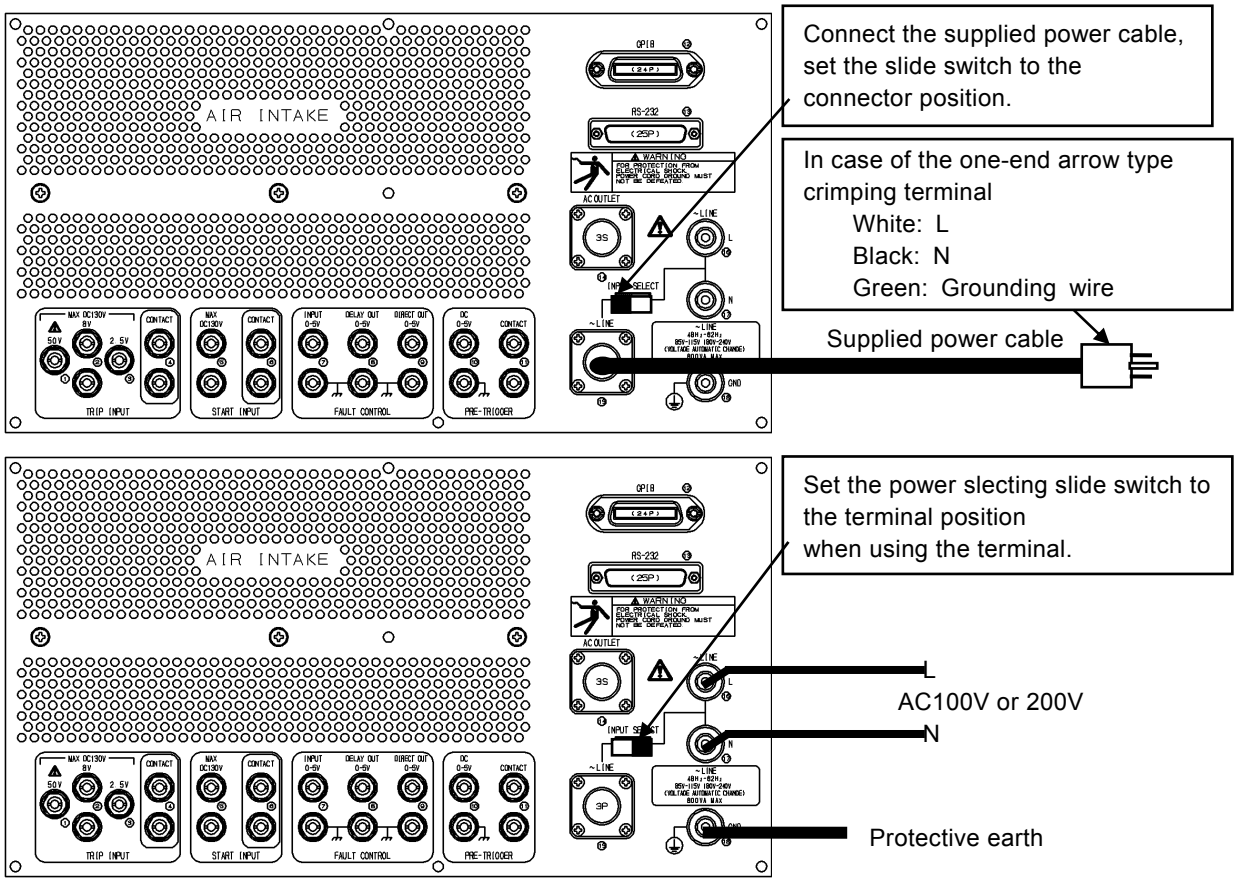


Figure 2-2 Connection of power cable

The RX4718W has a power output connector connecting in parallel with the power input. When two or more units of this series are used, use the supplied daisy-chain cable and connect the power output connector of the RX4718W to the power input connector of other equipment.

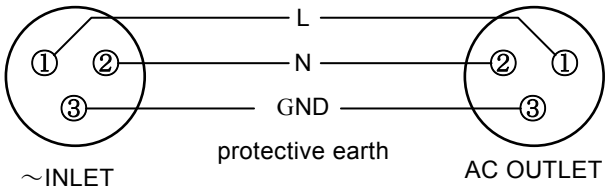


Figure 2-3 Pin connection of power input connector and power output connector

⚠ Caution

The maximum current capacities of the power input connector and the power output connector are 15A. Use under the range of capacity.

3. Description of Panel Controls and Basic Operation

3.1 Name and function of each part of the panel

This manual uses the following indications.

Names on the keys and function names indicated on the key top :
GPIB LOCAL、MEMORY No

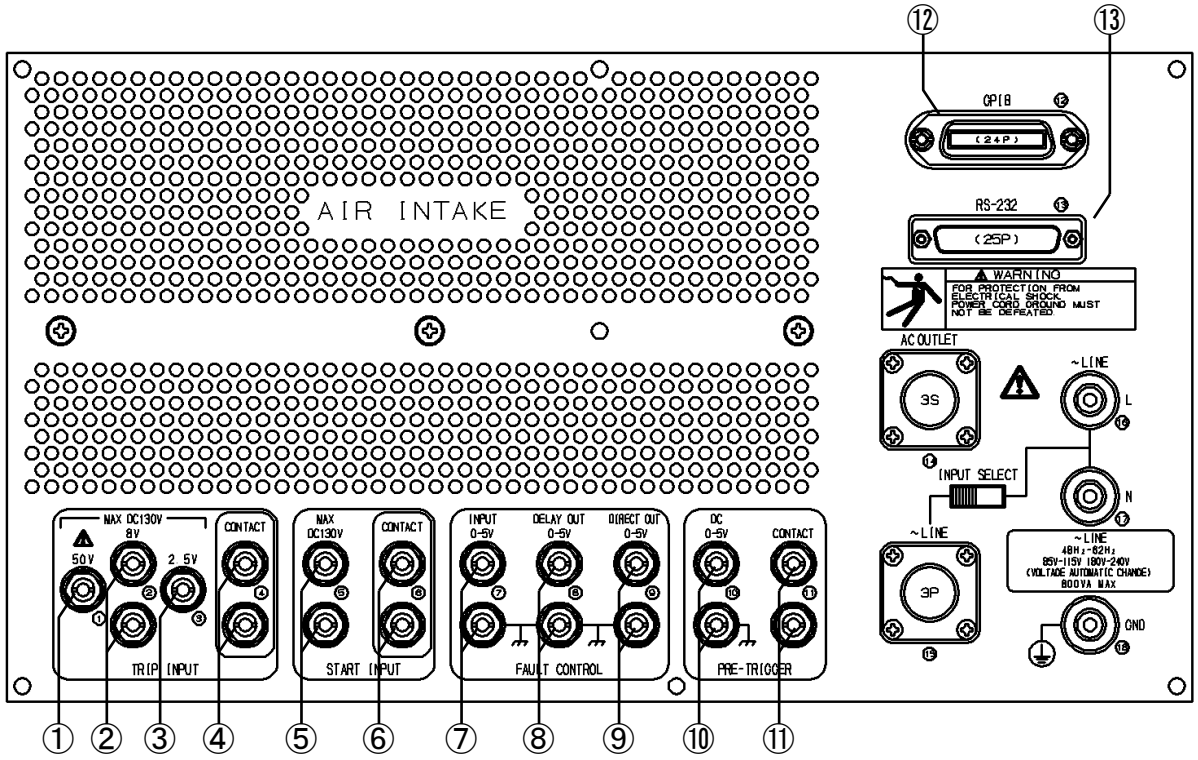
Names of the function indicated in orange under the key :
OTHER FUNC、READ

Names of LED (excluding the keys with LED) :
<Over>、<Trip signal>

Some names in the fluorescent display :
【SETTING / DATA】、【Operation mode】

Display on the fluorescent display :
[ROM CHECK ERROR]、[Sine wave]

3.1.1 Left side panel



①-④ **TRIP INPUT(floating)** ☞"3.5.1 Trip input and operation start input"

This terminal receives operation-signal-input of a protective relay.

The maximum allowable voltage is +130V DC. (① to ③: voltage input, the lower side terminal of ② is common))

The withstand voltage to the chassis is 354V peak (250Vrms).

① Threshold voltage of +50V terminal High level: +50.0V
Low level: +40.0V

② Threshold voltage of +8V terminal High level: +8.0V
Low level: +5.0V

③ Threshold voltage of +2.5V terminal High level: +2.5V
Low level: +1.0V

④ are input terminals with the open-circuit voltage of +5V and the short-circuit current of 10mA for a contact.

⑤⑥ **START INPUT (floating)** ☞"3.5.1 Trip input and operation start input"

This terminal receives the signal input to start the quick change/sweep operation externally.

The withstand voltage to the chassis is 354V peak (250Vrms).

⑤ can receive voltage-input with the allowable maximum input voltage of DC+130V.

Threshold voltage High level: +2.5V
Low level: +1.0V

⑥ are input terminals with the open-circuit voltage of +5V and the short-circuit current of 10mA for a contact.

⚠ **Caution**

Don't apply the voltage to the contact input(④ and ⑥), or the contact input circuit may be damaged.

Quick change command (Fault control)

⑦ **INPUT (Chassis potential)** ☞"4.4.2 Synchronization of quick change operation"

These terminals is used for inputting signals to externally control the normal/fault-output of RX4718W.

Although this signal turns the output to normal or fault state, it does not trigger the timer.

The input signal must be a TTL level signal of 0 or 5V.

TTL level signal of 0V turns the output signal to the fault state.

Threshold voltage	High level: +2.5V Low level: +1.0V
The allowable maximum input voltage	DC+130V

⑧ **DELAY OUT (Chassis potential)** ☞"3.5.3 Operation of quick change mode"

Output signal of TTL level of 0 or 5V is output when the output status of REX4708AW changes quickly.

Output signal becomes Low of logic when the output of REX4708AW is in a fault state.

It is used to control the normal/fault condition of 4705A, etc. simultaneously.

⑨ **DIRECT OUT (Chassis potential)** ☞"3.5.3 Operation of quick change mode"

This is a signal that changes just after operation command (start-input⑤,⑥, or command key㊹) is applied.

It is a TTL level signal and becomes Low when in a FAULT condition.

When the fault delay time (pre-trigger time) and the fault start phase has been set, at first ⑨Direct-out becomes Low, and after the fault delay time elapses, amplifier output turns fault state from normal state at the timing of the fault-start-phase, and ⑧(Quick-change-command-)Delay-output becomes Low.

⑩⑪ **PRE-TRIGGER OUT** ☞"3.5.3 Operation of quick change mode"

These terminals outputs signal (TTL level, contact) to activate the oscilloscope.

The signal becomes Low on quick change start-command.

The signal returns to High 0.1 second after the output returns to normal state.

⑩ is TTL level signal (chassis potential), and ⑪ is a contact signal (floating).

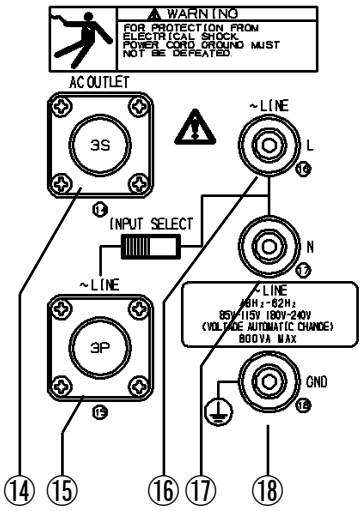
⑪contact signal has the withstand voltage to the chassis is 354Vpeak (250Vrms).

⑫ **GPIB (Chassis potential)** ☞"5.1.1 GPIB specifications"

This is a connector to control GPIB.

⑬ **RS-232C (Chassis potential)** ☞"6.2.2 Connector and signal line"

This is a connector to control RS-232C.



⑭ AC OUTLET (floating) ☞"2.3 Grounding and power supply"

This is an output connector connected in parallel with the power input of the RX4718W.
The withstand voltage to the chassis is 2121Vpeak (1500Vrms).
When two or more units of this series are used, use the supplied daisy-chain cable to connect with the power input connector of other equipment.

⑮ ～ LINE (POWER INPUT) (floating) ☞"2.3 Grounding and power supply"

This is the connector for power input. The withstand voltage to the chassis is 2121Vpeak (1500Vrms).
The supplied power cable is used. When this connector is used, set the input switching slide switch to this connector side.

⑯⑰ ～ LINE (floating) ☞"2.3 Grounding and power supply"

Use this power input terminal when the supplied power cable is missing.
The withstand voltage to the chassis is 2121Vpeak (1500Vrms).
When this terminal is used, set the input switching slide switch to this terminal side.

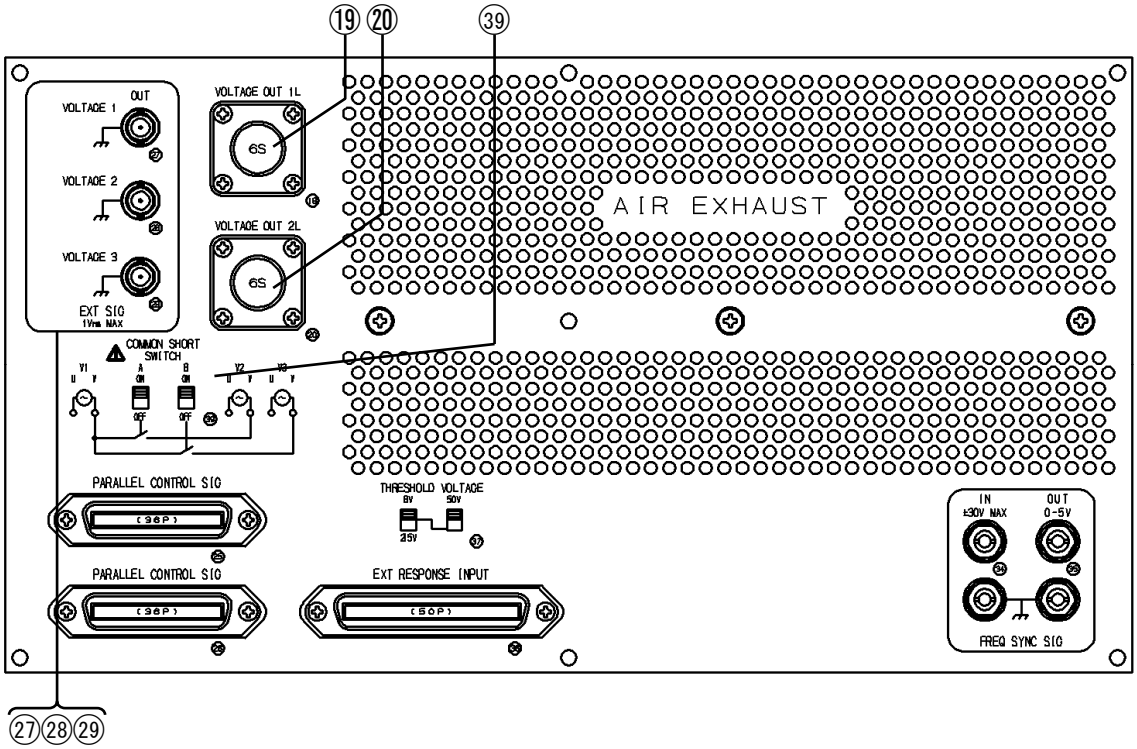
⑱ GND (grounding terminal) ☞"2.3 Grounding and power supply"

This is the protective grounding terminal which is connected to the chassis.

⚠ Warning

Power input terminals of ⑯ and ⑰ are for emergency. Avoid using them all the times because of the risk of electric shock.
Always ground to be safe.

3.1.2 Right side panel



⑲ **VOLTAGE OUT 1L (floating)** ☞"3.3.4 Output "

This is a connector of the voltage output 1L side. When setting of the output selector is 3-phase 1L, the selected mode becomes 3-phase 4-wire connection.

When setting of the output selector is a single phase, the " voltage-out-1 " is selected.

The withstand voltage to the chassis is 707 Vpeak (500Vrms).

⑳ **VOLTAGE OUT 2L (floating)** ☞"3.3.4 Output "

This is a connector on the voltage output 2L side. When setting of the output selector is 3-phase 2L, the selected mode becomes 3-phase 4-wire connection.

When setting of the output selector is a single phase, the " voltage-out-3 " is selected.

The withstand voltage to the chassis is 707 Vpeak (500Vrms).

㊴ **COMMON SHORT SWITCH** ☞"3.3.4 Output "

This is a switch connecting the commons of voltage-output-2 and 3 to that of voltage-output-1.

This setting becomes enabled when the front terminal is used, and disabled when the side terminal is used.

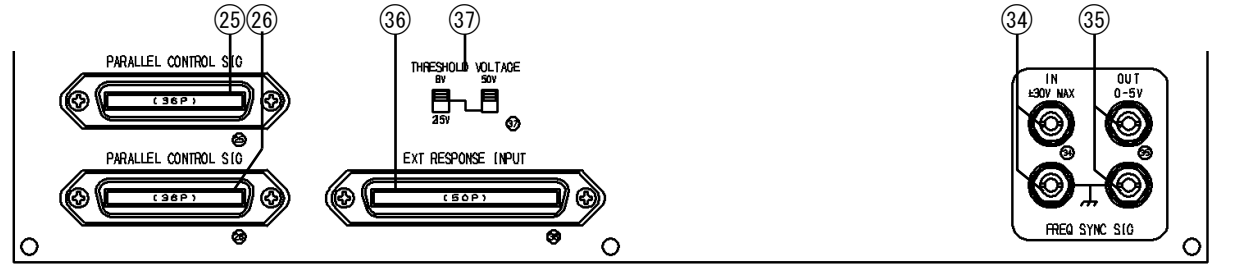
Switch A: between voltage-output-2 and 1 Switch B: between voltage-output-3 and 1

㉗㉘㉙ **EXT SIG OUT (chassis potential)** ☞"4.2 Amplifier input signal selection"

"OUTPUT" is the signal output terminal that the internal synthesizer signal is output.

The range full scale output level is 1Vrms.

This signal is used when the amplifier-input-selection is the external output setting to drive the external amplifier.



㉕㉖ **PARALLEL CONTROL SIG (chassis potential)** ☞"4.1.2 Master/slave connection"

This is a connector connected for master/slave operation. ㉕ and ㉖ are connected in parallel.

㊱ **EXT RESONSE INPUT (floating)** ☞"4.3 Operation of extended response input"

This is the connector connecting the expanded response input box (optional) to expand the trip input up to 255 channels. The input of the expanded response input box must be connected to the trip input of ① to ③ according to the ㊲threshold voltage. The withstand voltage of the response input terminal is 354Vpeak (250Vrms) against the chassis. (The logic control terminal is a chassis potential.)

㊲ **THRESHOLD VOLTAGE** ☞"4.3 Operation of extended response input"

This is a switch to set the threshold voltage for the response input of ㊱expanded external response input.

㉞ **FREQ SYNC SIG IN (chassis potential)** ☞"3.4.1 Frequency setting"

This is a signal input to bring the frequency of RX4718W into synchronization with the external signal and used when the frequency mode is the external sync setting.

The falling edge of TTL level signal will have a phase of 0°.

The allowable maximum input voltage is DC±30V.

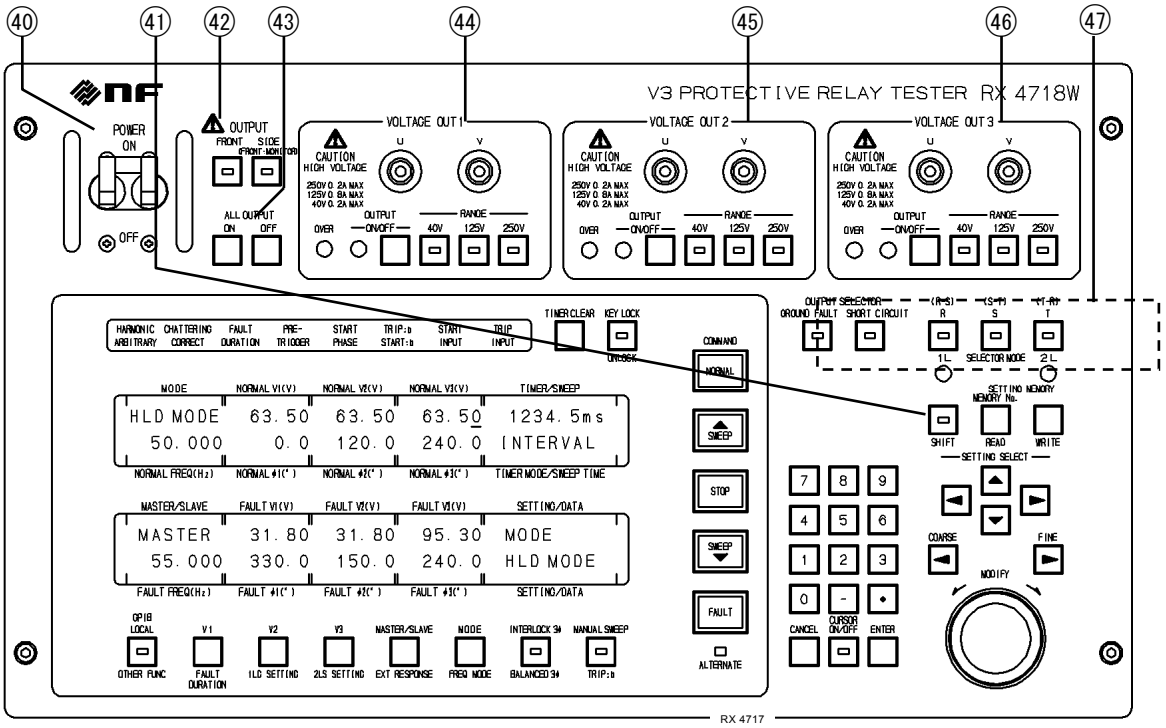
Threshold voltage	High level: +2.5V
	Low level: +1.5V

㉟ **FREQ SYNC SIG OUT (Chassis potential)** ☞"3.4.1 Frequency setting"

This outputs the internal frequency of RX4718W.

The falling edge of TTL level signal will have a phase of 0°.

3.1.3 Front panel



⑩ **POWER ON/OFF**

This is a power supply switch. It also works as a non-fuse breaker (NFB) to shut off the power if too much current flows, or when the internal temperature extremely rises.

⑪ **SHIFT**

In order to use the function marked in orange below each button, press this SHIFT key to turn on the LED of SHIFT key before pressing the button for the desired function.

Example of key input display for SHIFT → SHIFT+OTHER FUNC

⑫ **OUTPUT (selection)** ☞"3.3.4 Output "

FRONT

The amplifier output is output to the output terminal on the front panel.

SIDE

The amplifier output is output to ⑲VOLTAGE OUT 1L and ⑳VOLTAGE OUT 2L on the right side panel, and ⑰"OUTPUT SELECTOR" key becomes valid.

⚠ CAUTION

For SIDE, the output terminal of ⑭ ⑮ ⑯VOLTAGE OUT can be used as monitor terminal, but no load can be connected.

㊸ ALL OUTPUT

This is a key to allow all the amplifier outputs to be turned on and off at once.

㊹㊺㊻ VOLTAGE OUT

OUT U - V (floating) ☞"3.3.4 Output "

These are the amplifier output terminals on the front panel.
The withstand voltage to the chassis is 707Vpeak (500Vrms).
The maximum output voltage is 250V. Take great care of handling it.

<OVER> ☞"3.3.3 Operation at overload"

This LED illuminates when overloading.

OUTPUT ON/OFF

ON/OFF key sets on and off independently. <ON> LED lights up when the output is on.

RANGE **40V**、**125V**、**250V** ☞"3.3.1 Setting of output range"

These are the setting keys for the output range.
The LED of the range key selected will be turned up.

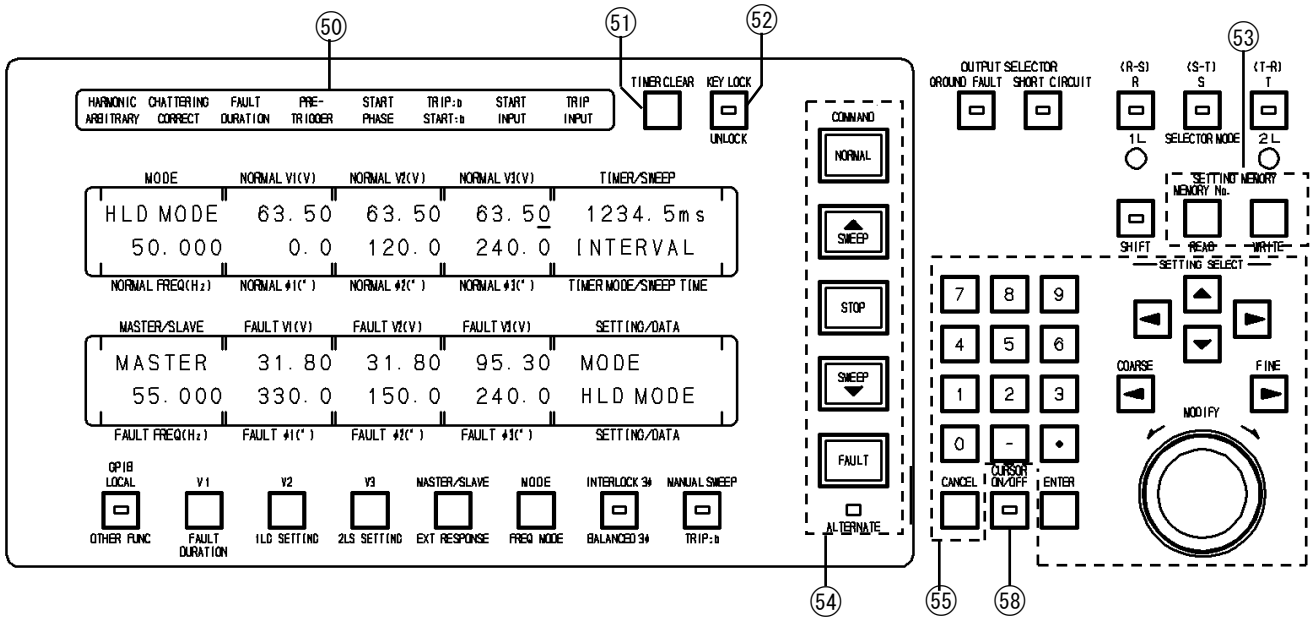
㊼ OUTPUT SELECTOR ☞"3.3.4 Output "

GROUND FAULT、**SHORT CIRCUIT**

When the selector mode is a single phase, push the GROUND FAULT key or SHORT CICUIT key for the output connection. " Voltage-out-1 " and " Voltage-out-2 " signals are connected to Voltage out 1L and Voltage out 2L connecter pins respectively according to **R**、**S**、**T** key setting.

See Fig3-4 and Fig3-5.

SHIFT+1L : the Voltage out 1L connecter is available when 3-phase setting..
SHIFT+2L : the Voltage out 2L connecter is available when 3-phase setting.
SHIFT+SELECTOR MODE displays the selector mode on the【SETTING / DATA】display.



⑤⓪ (STATUS DISPLAY LED)

<HANRMONIC ARBITRARY>

This indicates the status of output waveform. It lights up for sine wave and black out for the waveforms other than sine wave.

<CHATTERING CORRECT>, <FAULT DURATION>, <PRE-TRIGGER>, <START PHASE>

These light up when the functions are valid.

<TRIP: b>, <START: b>

Logic setting of [TRIP INPUT] and [START INPUT] signal.

This LED lights up when the negative-logic is set.

negative-logic: contact-state is open-circuit / voltage do not be applied

This LED do not light up when the positive-logic is set.

positive-logic: contact-state is short-circuit / voltage is applied

<START INPUT>、<TRIP INPUT>

These LED light up when the signal is applied to the input terminal (applying voltage for voltage input, short-circuit for contact input).

⑤① TIMER CLEAR

This resets the measurement value of the timer counter.

☞"3.5.3.A Timer", "3.5.8 Operation of SOR quick change mode (Step-out Relay)"

⑤② KEY LOCK

Pressing this key disables the panel control, and lights up the LED

(Except for OUTPUT ALL ON/OFF, each output ON/OFF, GPIB LOCAL, SHIFT+LOCK OFF)

SHIFT+LOCK OFF enables the panel control, and lights off the LED.

㊸ PANEL SET

☞"3.6.2 Panel setting memory"

MEMORY No

This key specifies the memory number for panel setting. The memory number is displayed on the【SETTING / DATA】display, and the number can be selected by MODIFY dial.

SHIFT+WRITE, SHIFT+READ

Setting data on the front panel can be stored into the built-in memory, and the stored data in the memory beforehand is recalled as the panel data.

㊹ COMMAND key

☞"3.5 Operation mode"

NORMAL

This command button is used to set the output signal to normal value.

SWEEP▲

This command button is used to start sweep from the fault value to the normal value when the system is in sweep mode.

STOP

This command button is used to halt the sweep temporarily when the system is in sweep mode.

SWEEP▼

This command button is used to start sweep from the normal value to the fault value when the system is in sweep mode.

FAULT

This command button is used to set the output signal to the fault value.

The following operations are available with PSW mode.

MOMENTARY: returns to the normal value when released.

ALTERNATE: the fault value remains even when released.
To return to the normal value, press FAULT again or NORMAL.

<ALTERNATE>

This lights up when the PWS mode is ALTERNATE.

㊺ DATA INPUT

Setting select ▲, ▼, ◄, ►

This key moves the cursor for selection of item on the fluorescent display.

COARSE◄, FINE►

This key moves the cursor on the digits.

MODIFY

This key increases/decreases numerical value of the digit where the cursor is placed or change the setting.

Numeral buttons 0-9, −, . and CANCEL

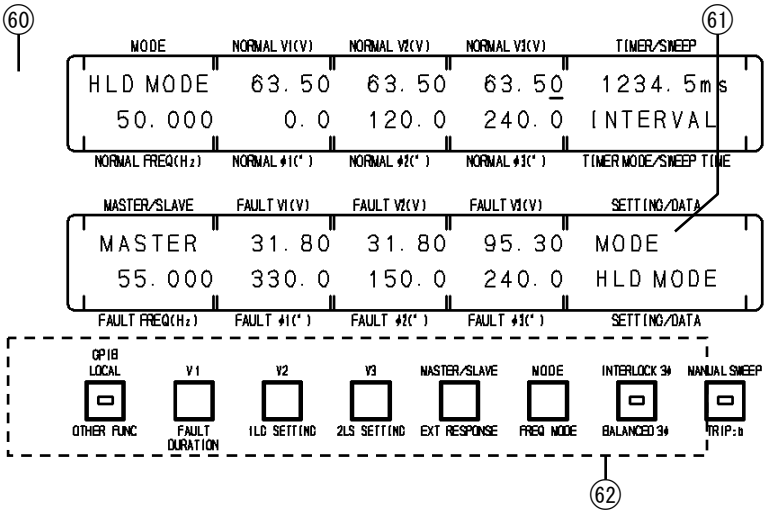
This key allows direct input of numerical value. Pressing CANCEL cancels the number in the order in which the number has been input.

ENTER

This key establishes the value input, or the setting has been changed.

⑯ **CURSOR ON/OFF** ☞"4.1.3 B) Simultaneous setting change"

This key toggles the indication of the cursor on and off. When the cursor indication is not displayed, the LED lights up.



⑥⓪ **Upper fluorescent display**

【MODE】

The operation mode is displayed. To select the operation mode, use **MODE** key of ⑥②

【NORMAL FREQ】

The value of the normal frequency is displayed.

【NORMAL VOL 1-3】, 【NORMAL PHASE 1-3】

The normal values of amplitude (upper part), and phase (lower part) are displayed.

【TIMER/SWEEP】

The measurement value of the timer and the sweep position is displayed.

【TIMER MODE/SWEEP TIME】

The timer mode, the timer measurement value and the sweep time are displayed.

⑥① **Lower fluorescent display**

【MASTER/SLAVE】

The status of master/slave function is displayed. Use **MASTER / SLAVE** key of ⑥②.
Mode indication: **【MASTER】** **【SLAVE】** **【SEPARATE】**

【FAULT FREQ】

The fault frequency is displayed.

【FAULT VOL 1-3】, 【FAULT PHASE 1-3】

The fault values of amplitude (upper part) and phase (lower part) are displayed.

【SETTING / DATA】

This is used to set various functions and display data.

⑫ Each setting key

GPIB LOCAL ☞"5.2.4 Remote/local behavior"

This key cancels the remote condition of GPIB control to enable the panel control when it is a remote control condition, and the LED lights up.

SHIFT+OTHER FUNC. ☞"3.6.1 Other function"

In pushing SHIFT+OTHER FUNC key, the other function is displayed on the【SETTING / DATA】display.

VOL 1 ☞"3.5.3.B) Fault duration"

Every time this key is pressed, the cursor position shifts as below.

【NORMAL V1】→【NORMAL ϕ1】→【FAULT V1】→【FAULT ϕ1】→【NORMAL V1】

SHIFT+FAULT DURATION displays the fault duration on the【SETTING / DATA】display.

VOL 2 ☞"3.4.2.0 1LG setting"

Every time this key is pressed, the cursor position shifts as below.

【NORMAL V2】→【NORMAL ϕ2】→【FAULT V2】→【FAULT ϕ2】→【NORMAL V2】.

SHIFT+1LG SETTING displays the 1LG setting on the 【SETTING / DATA】display.

VOL 3 ☞"3.4.2. B) 2LS setting"

Every time this key is pressed, the cursor position shifts as below.

【NORMAL V3】→ 【NORMAL ϕ3】→ 【FAULT V3】→ 【FAULT ϕ3】→【NORMAL V3】

SHFT+2LS SETTING displays the 2LS setting on the 【SETTING / DATA】display.

MASTER / SLAVE

This displays the master/slave setting on the 【SETTING / DATA】display.

SHIFT+EXT RESPNS INPUT displays the extended response input on the【SETTING / DATA】display.

☞"4.1.1 Master/slave setting", "4.3 Operation of extended response input"

OPERATION MODE ☞"3.5 Operation mode", "3.4.1 Frequency setting"

This displays the operation mode on the 【SETTING / DATA】display.

SHIFT+FREQ MODE displays the frequency mode on the 【SETTING / DATA】display.

INTERLOCK 3ϕ ☞"3.4.2 A) Balanced 3-phase and Interlock 3-phase "

When this key is pressed, the LED lights on and the amplitude or phase of voltage output can be changed in all three chnnels at the same time using MODIFY. Pressing this key again turns the LED off and cancels the function.

SHIFT+ BALANCED 3ϕ allows setting of the balanced three phases, and the phase reference is the output signal where the cursor is placed.

MANUAL SWEEP

When the operation mode is a "sweep", pressing this key lights the LED on and allows changing the sweep position manually. Pressing it again turns the LED off and cancels the function.

SHIFT+TRIP INPUT: b selects the trip-input-logic.

☞"3.5.5 A) Manual sweep", "3.5.1 A) Setting of [TRIP INPUT] logic"

3.2 Start

3.2.1 Power on

Install the RX4718W unit and turn the power on according to 2.1 Installation location and 2.3 Grounding and power supply.
After turning the power on, the following self-tests are conducted automatically.

Turning on all LED except for <OVER> for testing lamps.
Turning on all of fluorescent display for dot testing.
Software version display
Memory check

If there are no abnormalities, the RX4718W is set to the last settings stored in the memory, because its memory retains the settings at the last power-off-timing.
Its outputs, however, always stays with off-state for safety reasons.

If RX4718W checks its memory and finds any error, the lower fluorescent display shows either of the following messages:

[ROM CHECK ERROR]	This indicates the program memory has error.
[RAM CHECK ERROR]	This indicates the RAM has error.
[CHECK SUM ERROR]	This indicates the data stored in battery-back upped memory has error.

[ROM CHECK ERROR] and [RAM CHECK ERROR] means malfunction in RX4718W.
Cut power off immediately, and contact our company or our sales agent.

In the case of check-sum-error, [CHECK SUM ERROR] is displayed for ten seconds or so, then, RX4718W is set to initial-setting (50Hz) and start to work.
If the battery, which should backup the memory, has been discharged, even then check-sum-error will also occurs.
To fully recharge a completely discharged-battery, it takes about 100-hour energizing.
When the battery is fully charged, the data in memory are retained about 60 days with some variation depending on the condition of the individual unit and ambient temperature.
A deteriorated battery can retain data for a shorter period.
If the ability of the battery becomes impractical, ask the company for replacement at cost.

If the power is turned off during setting operation, [CHECK SUM ERROR] may occur when the power is turned on the next time. Therefore, turn off the power one or more seconds after the finish of setting or alternation procedure.

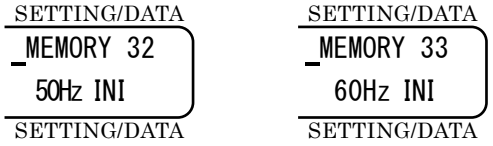
Measures for other errors ☞“7.1Error message“

3.2.2 Initial setting

There are two types of the panel initial setting, which are 50Hz and 60Hz.
The factory setting is 50Hz. ☞"Table 3-1 List of Initial Values of Panel Setting"

This initial setting serves as reset when the current setting is unknown and does not operate well.
The initial setting is established as following.

Press ㊸ MEMORY No key to display the memory number on the 【SETTING / DATA】 display.
Rotate MODIFY key to set [Memory 32 50Hz INI] or [Memory 33 60Hz INI] on the 【SETTING / DATA】 display.



Press SHIFT+READ key to set the selected initial data.
[MEMORY **] is displayed on the 【SETTING / DATA】 display during setting the data.
All outputs of the amplifier are turned off for safety at the time of setting the data.
Memory data of number 32 and 33 cannot be rewritten, but memory data of number 1 to 31 can be rewritten.

Table 3-1 List of Initial Values of Panel Setting

Setting parameters	Initial values
Output range and output control	40V, OFF
Output changer mode	Front terminal
Normal / Fault frequency	50Hz (memory 32)/60Hz (memory 33)
Normal / Fault amplitude	0V
Normal / Fault phase	V1: 0 ° V2: 120 V3: 240 °
Phase setting (＋:lag ,－:lead)	Without negative sign
Operation mode	Manual
Master/slave / Separate	Separate
Frequency mode	50Hz fixed (memory No 32) 60Hz fixed (memory No 33)
Waveform selection	Sine wave
Amplifier input signal Ext-sig-out amplitude	Internal, 0V
Output selector single-phase setting	Ground fault, R
Output selector 3-phase setting	1L, R
Timer mode	Interval
Timer setting : timer clear	Auto
Timer setting : automatic recovery	ON
Trip input logic	↑a : RISE
Chattering removal time setting	1ms, OFF
Expanded response input	0
Operation Start signal logic	↑a : RISE
Stop setting of operation start input	Unused
Fault duration time	1s, OFF
Pre-trigger time	10ms, OFF
Fault start phase	0° , OFF
Sweep time	100s

Setting parameters	Initial values
Operation/recovery fault wait time	0.5s
Search / DSK search number of times	3
Search / DSK search judge-time	0.1s
Search / DSK search trip wait time	5.0s
Search / DSK search output cut control	Use
Frequency relay test cross frequency	48.5Hz (memory 32)/58.5Hz (memory 33)
Frequency relay test sweep rate	1Hz/s
Frequency relay test hold time	0.5s
Frequency relay test amplitude quick-change control	OFF
SOR quick change step 2, 3 amplitude	0V、0A
SOR quick change step 2, 3 phase	0°
SOR quick change step 1 wait time	0.1s
SOR quick change step 2, 3, 4 wait time	0s
Harmonic 1 amplitude	100% (1 degree), 0% (2-25 degrees)
Harmonic 1 phase	0 ° (all degrees)
Harmonic writing flag	0 (no computation)
Trip phase selection	3-phase
Output selection communication	OFF
PSW mode	Alternate
Beep sound setting	ON

3.3 Operation of amplifier output

RX4718W contains 3 voltage-amplifiers which are isolated with the withstand voltage 707Vpeak (500Vrms) between each output and the chassis.

⚠ Caution

When the amplifier outputs are connected in series, make sure that output voltage does not exceed the withstand voltage to the chassis. When the RX4718W is used with the voltage exceeding the withstand voltage, malfunction or damage to the equipment may occur.
The RX4718W can be used up to 500Vrms with 2-output series connection but can not used over 500Vrms with 3-output series connection.

Parallel connection is not available for the voltage output. If connection is made accidentally, malfunction or damage to the equipment may occur.

⚠ Warning

The maximum output voltage of the voltage amplifier is 250V.
Pay extreme attention to handling the amplifier to avoid the hazard of electric shock.
Always turn the output off when connecting wires to the output terminal.

3.3.1 Setting of output range

The output range includes 40V, 125V and 250V, and the rated load and the preset resolution for each range is as follows in AC mode (sine wave, harmonic 1 and arbitrary) and DC mode (+DC and –DC).

Table 3-2 List of voltage output range

Range: AC	Rated load: AC
250V (0.00V-250.00V)	1250 Ω
125V (0.00V-125.00V)	156 Ω
40V (0.000V-40.000V)	200 Ω

Range: ±DC	Rated load: DC
250V (0.0V-250.0V)	2500 Ω
125V (0.0V-125.0V)	1250 Ω
40V (0.00V-40.00V)	400 Ω

The output range is set when a setting key for the output range ㊹,㊺,㊻ is pressed and the LED of the key lights up. The output range can be set for each output.
When range setting is changed, the amplitude of the amplifier output turns to 0V, and the amplifier output is disconnected from the output terminals.

3.3.2 Output ON/OFF

Output ON/OFF control has two types:

[OUTPUT] ON/OFF key of ㊹/㊺/㊻: each outputs turn ON/OFF individually according to the each key setting

[ALL OUTPUT] ON/ OFF ㊸key : all outputs turn ON/OFF all together.

Output signal go on outputting when <ON> LED (at the left side of ON/OFF key of ㊹㊺㊻) is lighting.
When ON/OFF key of ㊹㊺㊻ is pressed during the output-ON-state, the output is turned to OFF-state and the <ON> LED turns off.

㊸[ALL OUTPUT] ON - OFF key-operation may be dangerous if not operated properly, so ㊸[ALL OUTPUT] ON - OFF key-operation can be set to be enabled / disabled by the internal dip switch.

☞"2.2 Setting of internal dip switch"

3.3.3 Operation at overload

When overload occurs, ㊹㊺㊻<OVER>LED of the output where the overload occurs lights up.
If the overload status lasts for three seconds or longer, buzzer sounds longly and the output is automatically turned OFF as well as the output amplitude is set to zero for safety.

⚠ Caution

When the beep sound setting is OFF, the buzzer does not sound even if the overload occurs. It is recommended to turn ON the beep sound setting.

☞"3.6.1. A) Beep setting"

3.3.4 Output selector

The output amplifier 1 to 3 outputs the voltage signals according to the setting of the output selector.
The voltage signals are output to the one of output terminal (at the front panel) or connecters (at the right side).
When the voltage output connecter of [VOLTAGE OUT 1L and 2L] on the right side is used, use the 3-phase 4-wire cable supplied.

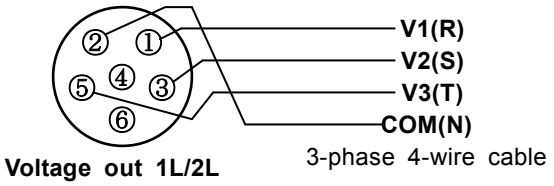


Figure 3-1 Pin Connection of Voltage Output 1L/2L Connector and 3-phase 4-wire Voltage Output Cable

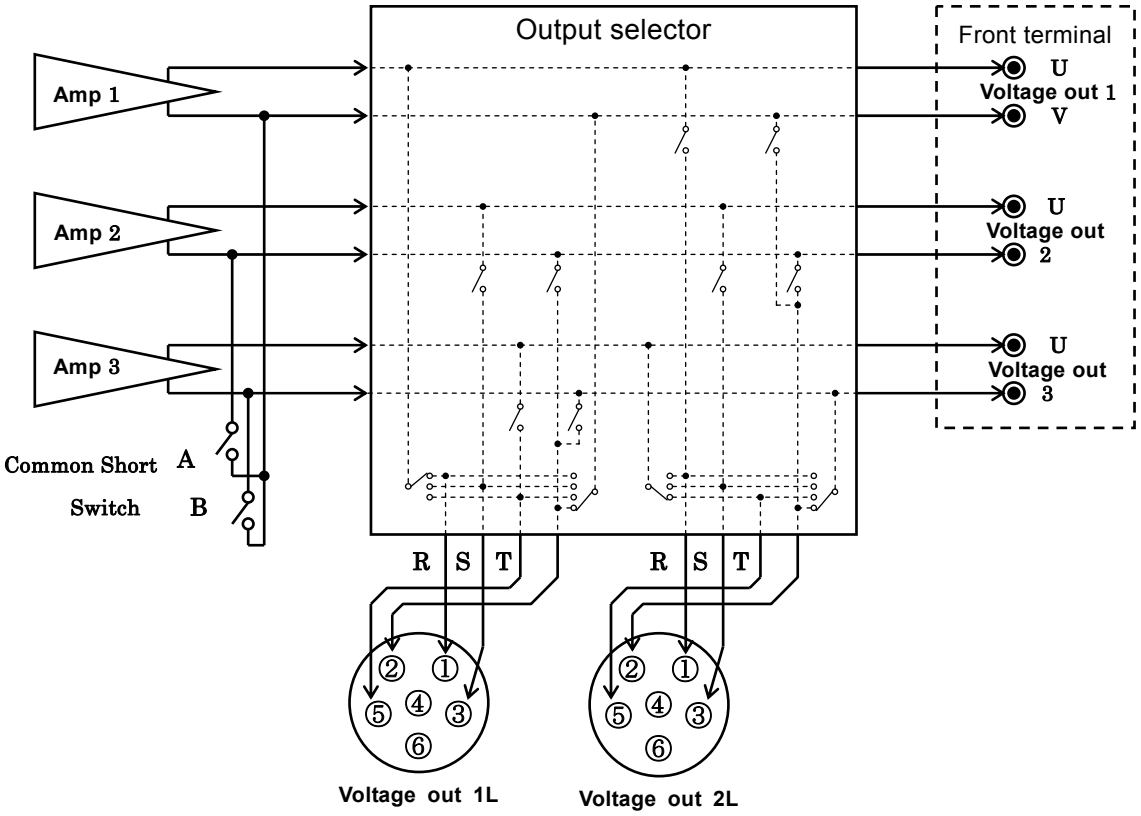


Figure 3-2 Configuration of Output Changer

The output selection mode has front terminal and side terminal (voltage output 1L and 2L), and the side terminal has 3-phase mode and single-phase mode (ground fault, short-circuit).
When the output selection mode is changed, the all of 3ch-outputs are turned off for safety.

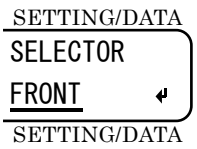
⚠ Caution

When the output selection mode is set to side terminal, the voltage is output to the front terminal for monitoring but the load can not be connected to the front terminal.

A) Output to Front terminal

The voltage signals of amplifier 1 to 3 are output to U-V terminal on the front panel, and LED of ㊷FRONT key is turned on. There are two setting procedures as shown below.

- Press ㊷FRONT key .
- Press ㊶SHIFT+ ㊼SELECTOR MODE to display the selector mode on the【SETTING / DATA】display.
  Rotate MODIFY to select [FRONT] and press ㊺ENTER.



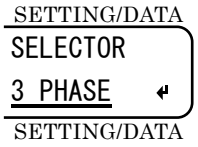
Common-connect-switch ㊴A and B on the right side panel are used to connect the common line of the voltage-outputs when the output selector is set to the front terminal. This setting is disabled when the side connecter is used.

After the selector mode has been set to the front terminal, pressing ㊷SIDE key turns LED on and the 3-phase or single-phase setting selected previously is recovered.

B) Output to Side connecter

The voltage signals of amplifier 1 to 3 are output to connecter of 1L or 2L, and the LED of ㊷SIDE key is turned on.

- Setting procedure
  Press ㊶SHIFT+㊼SELECTOR MODE to display the selector mode on the【SETTING / DATA】disply.
  Rotate MODIFY to select [3 PHASE] and press ㊺ENTER.



In 3-PHASE mode, output signals are distributed to either connecter of [1L] or [2L]. If the output connection is toggeled between connecter of [1L] and [2L], the output signal is not turned off.

■ Voltage-out-1L setting

Pressing SHIFT+㊼1L turns < 1L > on, and voltage signals of the voltage amplifier 1 to 3 are output to each pin of voltage-output-1L connector with the following connections.

Voltage amplifier 1 U——————→pin-① of voltage output 1L--- R line
Voltage amplifier 2 U——————→pin-③ of voltage output 1L--- S line
Voltage amplifier 3 U——————→pin-⑤ of voltage output 1L--- T line
Voltage amplifier 1, 2, 3 V——————→pin-② of voltage output 1L--- Neutral line

■ Voltage-out-2L setting

Pressing SHIFT+㊼2L turns < 2L > on, and voltage signals of the voltage amplifier 1 to 3 are output to each pin of the voltage-output-2L with the following connections.

Voltage amplifier 1 U——————→pin-① of voltage output 2L--- R line
Voltage amplifier 2 U——————→pin-③ of voltage output 2L--- S line
Voltage amplifier 3 U——————→pin-⑤ of voltage output 2L--- T line
Voltage amplifier 1, 2, 3 V——————→pin-② of voltage output 2L--- Neutral line

■ Setting of R, S and T switch

When R, S, T are changed, both of [1L] and [2L] turns the all outputs off, and each voltage amplifier output 1 to 3 are rotated as below.

output pin no.	R	S	T
1	V1	V2	V3
3	V2	V3	V1
5	V3	V1	V2

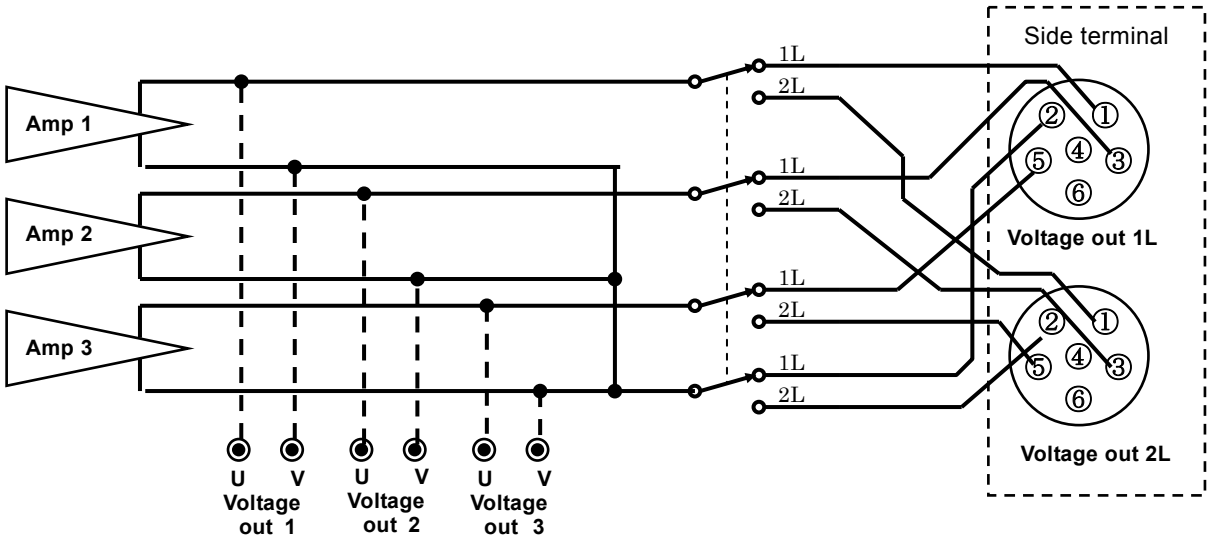


Figure 3-3 Operation of output selector in 3-PHASE setting

C) 1-PHASE

In 1-phase mode, the voltage-amplifier-1 signal is output to the voltage-output-connector 1L and the voltage-amplifier-3 signal is output to the voltage-output-connector 2L. The LED of ㊷SIDE is turned on.

- Setting procedure

  Press SHIFT+㊼SELECTOR MODE to display the selector mode on the 【SETTING / DATA】 display.
  Rotate MODIFY to select [1 PHASE] and press ENTER.

SETTING/DATA
SELECTOR
1 PHASE ↵
SETTING/DATA

In the single-phase setting, the voltage amplifier 2 signal is not used and the setting values for amplitude and phase are not indicated.

NORMAL V1(V)	NORMAL V2 (V)	NORMAL V3 (V)
63.50	--------	63.50
0.0	------	240.0
NORMAL φ1(°)	NORMAL φ2 (°)	NORMAL φ3(°)

The single-phase mode contains the ground-fault mode and short-circuit mode, and selection of R, S, and T is available for each mode. In the single-phase setting, the output is not turned off even if this selection is made.

■ Ground fault setting

When GROUND FAULT is pressed, the LED is turned on, and the 3-wire 4-phase mode is made for both output connection of 1L and 2L.

R, S, and T allows rotation as shown below.

		R	S	T	
Voltage amplifier 1	U——————→	(①)	(③)	(⑤)	Voltage output 1L
	V——————→	(②)	(②)	(②)	
Voltage amplifier 3	U——————→	(①)	(③)	(⑤)	Voltage output 2L
	V——————→	(②)	(②)	(②)	

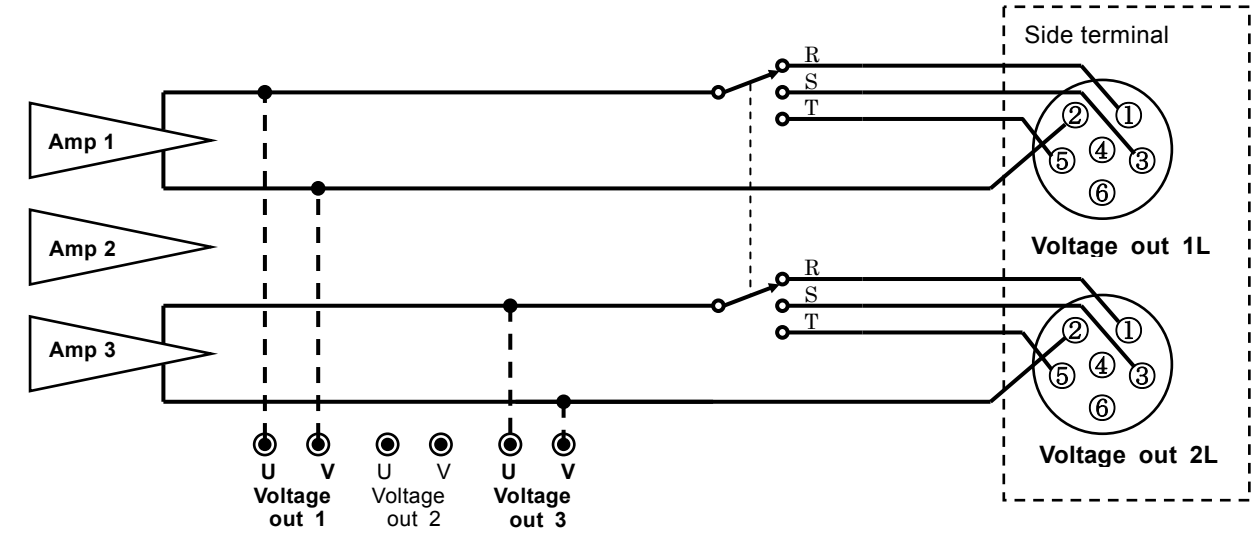


Figure 3-4 Operation of output selector in ground fault setting

■ Short circuit setting

Press ㊼ SHORT CIRCUIT and the LED is turned on, and line-to-line voltage connection is made for both output connection of 1L and 2L.

R, S, and T allows switching as shown below.

		R (R-S)	S (S-T)	T (T-R)	
Voltage amplifier 1	U——————→	(①)	(③)	(⑤)	Voltage output 1L
	V——————→	(③)	(⑤)	(①)	
Voltage amplifier 3	U——————→	(①)	(③)	(⑤)	Voltage output 2L
	V——————→	(③)	(⑤)	(①)	

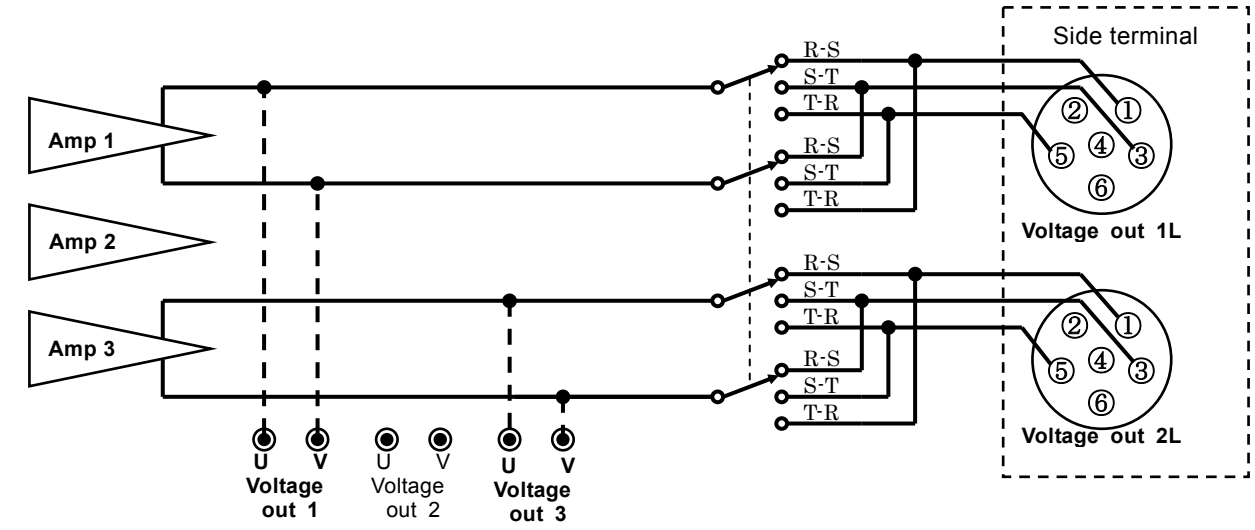


Figure 3-5 Operation of output selector in short circuit setting

3.4 Output signal setting

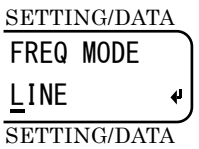
In case of using the internal synthesizer signal, refer to the description of "3.4.1 Setting of frequency" up to "3.4.3 Waveform selection"

3.4.1 Frequency setting

Frequency mode setting is common to all outputs.

- Setting procedure

  Press ㊶SHIFT+㊷FREQ MODE key to display the frequency mode on the【SETTING / DATA】display .
  Select the frequency mode to be set with MODIFIY dial, and press ㊺ENTER key.



■ 50Hz fixed [50Hz FIX]

The normal/fault frequency is 50Hz if [50Hz FIX] is displayed on the display of【NORMAL･FAULT FREQ】.

■ 60Hz fixed [60Hz FIX]

The normal/fault frequency is 60Hz if [60Hz FIX] is displayed on the display of【NORMAL･FAULT FREQ】.

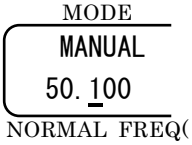
■ Internal [INTERNAL]

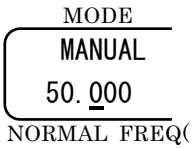
The normal/fault frequency is set in the range of 10.000 to 200.000Hz.

Since the normal frequency and the fault frequency can be set individually, the frequency quick change and the frequency sweep are available.

The following are one setting examples.

Move the cursor to【NORMAL FREQ】display with ▲, ▼, ◀ and ▶ and input 50.1 with the numeral buttons,and then press ENTER key.
The normal frequency is set to [50.100].
Next, move the cursor to the first decimal point of [50.**1**00] with COARSE◀ and FINE▶.
If the MODIFY is turned to the right, the number will increase to [50.**2**00], and if it is turned to the left, the number will decrease to [50.**0**00].
Setting of【FAULT FREQ】is available following the same procedure above.





■ Line synchronization [LINE]

The normal/fault frequency is synchronized with the commercial power supply frequency.
The synchronization frequency range is from 45 to 65Hz.
[LINE] is displayed on the【NORMAL･FAULT FREQ】display.

■ External synchronization [EXTERNAL]

The normal/fault frequency is synchronized with the signal applied to ㉞[FREQ SYNC SIG IN] terminal.
The synchronization frequency range is from 45 to 65Hz.
[EXTERNAL] is displayed on the【NORMAL FREQ】and【FAULT FREQ】display.

A) Refernce phase and frequency synchronization signal input/output

All phase difference settings of signals of the RX4718W (output phase and fault start phase) are the values in relation to a reference phase.

The following frequency synchronization signal output is used as a reference phase.

㉟[FREQ SYNC SIG OUT] (for 4705A,etc) : TTL signal output
The falling edge is the reference phase of 0 ° .

When the frequency mode is set for external synchronization, the following frequency synchronization signal inputs is used as the reference phase.

㉞[FREQ SYNC SIG IN] (for 4705A,etc) : TTL signal output
The falling edge is the reference phase of 0 ° .

When the negative-value-phase-setting is enabled, lead/lag-phase-setting is available, and setting range is from –359.9° to +359.9°.

All phase settings will take positive (+) value in lag-phase-setting.

Therefore, a setting of " 90° " will produce lag-phase of " 90° " in relation to the reference phase, and a setting of " –90° " will produce lead-phase of " 90° " in relation to the reference phase.

RX4718W is designed so that phase setting values are available freely.

In practical use, however, it would be simple and easy to assign phase of " 0° " to the phase of the output that the user wants to take for the reference.

☞"Figure 3-6 Output waveform with setting of V1: 0 ° , V2: 120 ° and V3: 240 ° "

3.4.2 Setting of amplitude and phase

The output amplitude setting is limited within the range-setting of the amplifier.

Therefore, set the output amplitude after setting the required range.

When the negative-value-phase-setting is disabled, lag-phase-setting is available, and setting value is from 0° to +359.9°.

When the negative-value-phase-setting is enabled, lead/lag-phase-setting is available, and setting value is from –359.9° to +359.9°. (" – " means lead-phase)

- How to enable the negative value in the phase setting
  Press SHIFT+⑫OTHER FUNC key and display the other function setting on the 【SETTING / DATA】 display.
  Turn MODIFY dial to select [PHASE MODE].
  Move the cursor down with ▼.
  Turn MODIFY dial to select either [MINUS on] or [MINUS off].

SETTING/DATA
PHASE MODE
MINUS off
SETTING/DATA

SETTING/DATA
PHASE MODE
MINUS on
SETTING/DATA

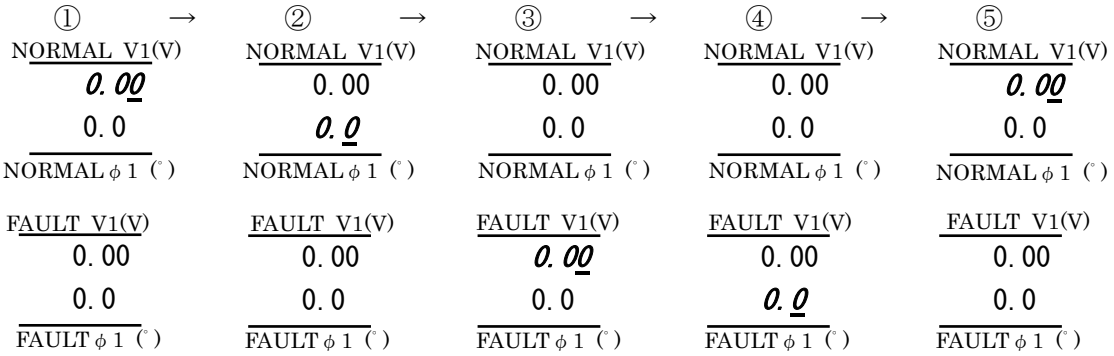
The amplitude are set respectively on the【NORMAL V1 to V3】and【FAULT V1 to V3】display.

The phase are set respectively on the【NORMAL ϕ 1 to ϕ 3】and 【FAULT ϕ 1 to ϕ 3】display .

The cursor can be moved on the items with ▲, ▼, ◄ and ►, but using ⑫VOL 1, VOL 2 and VOL 3 key is convenient as shown below.

① First press VOL 1 key to move the cursor to the【NORMAL V1】display.
② Press VOL 1 key again, and the cursor will be moved to the【NORMAL φ1】display.
③ Press VOL 1 key again, and the cursor will be moved to the【FAULT V1】display.
④ Press VOL 1 key again, and the cursor will be moved to the【FAULT φ1】display.
⑤ Press VOL 1 key again, and the cursor will go back to the【NORMAL V1】display.

The same operation is applied to VOL 2 and VOL 3 key.



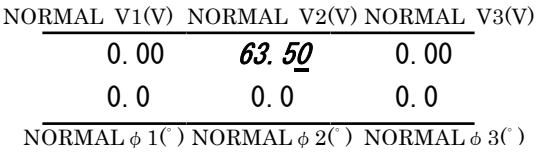
When the cursor is on the setting position for the amplitude and phase, the cursor movement by COARSE◄ and FINE► is limited to the last three digits.

Move the cursor to the place you wish to set, and set the amplitude value and phase value with the numerical buttons or MODIFY dial.

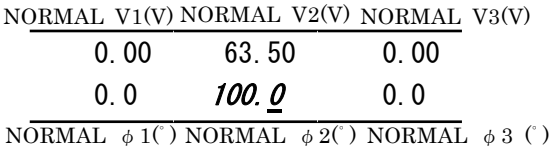
■ Setting example of amplitude and phase

Set the voltage-output-2 to 125V.

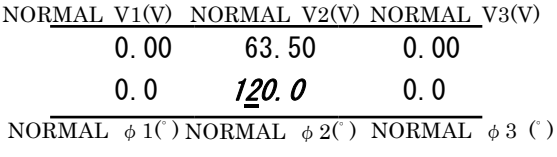
Press VOL 2 key to move the cursor to the【NORMAL V2】display. Input 63.5 with the numeral buttons and press ENTER key, and the normal voltage 2 will be set as 63.5V.



Then, press VOL 2 to move the cursor to the【NORMAL φ2】display. Input 100 with the numeral buttons and press ENTER key, and the normal phase 2 will be set as 100°.



Press COARSE◄ two times, t
hen turn MODIFY dial to the right for two times, and the normal phase 2 will be set as 120°.



A) Balanced 3-phase and Interlock 3-phase

SHIFT+ ⑫BALANCED 3ϕ allows automatic setting of balanced 3-phase with the phase where the cursor is placed as a standard.

The amplitude value of three outputs are set to the same value of the output where the cursor is placed, and the phase difference is shifted 120 ° in relation to the output where the cursor is placed.

- Setting example

  Set【NORMAL V2】to 63.5V and 【NORMAL ϕ2】to 120.0 °.

  Move the cursor to【NORMAL V2】or【NORMAL ϕ2】.

NORMAL V2(V)
63.50
120.0
NORMAL ϕ2(°)

  Press SHIFT+⑫BALANCED 3ϕ, and【NORMAL VOL·PHASE 1-3】becomes the balanced 3-phase setting as below.

NORMAL V1(V)	NORMAL V2(V)	NORMAL V3(V)
63.50	63.50	63.50
0.0	120.0	240.0
NORMAL ϕ1(°)	NORMAL ϕ2(°)	NORMAL ϕ3(°)

The above procedure is applied to the【FAULT VOL·PHASE 1-3】setting.

If the range setting of voltage-output-1 to 3 is different each other, an error occurs when the amplitude is set bigger than the range set.

The figure below shows the output waveform of ㉟ frequency sync signal and the normal voltage output 1 to 3 when the normal phase 1 is set to 0 °, normal phase 2 to 120 °, normal phase 3 to 240 °.

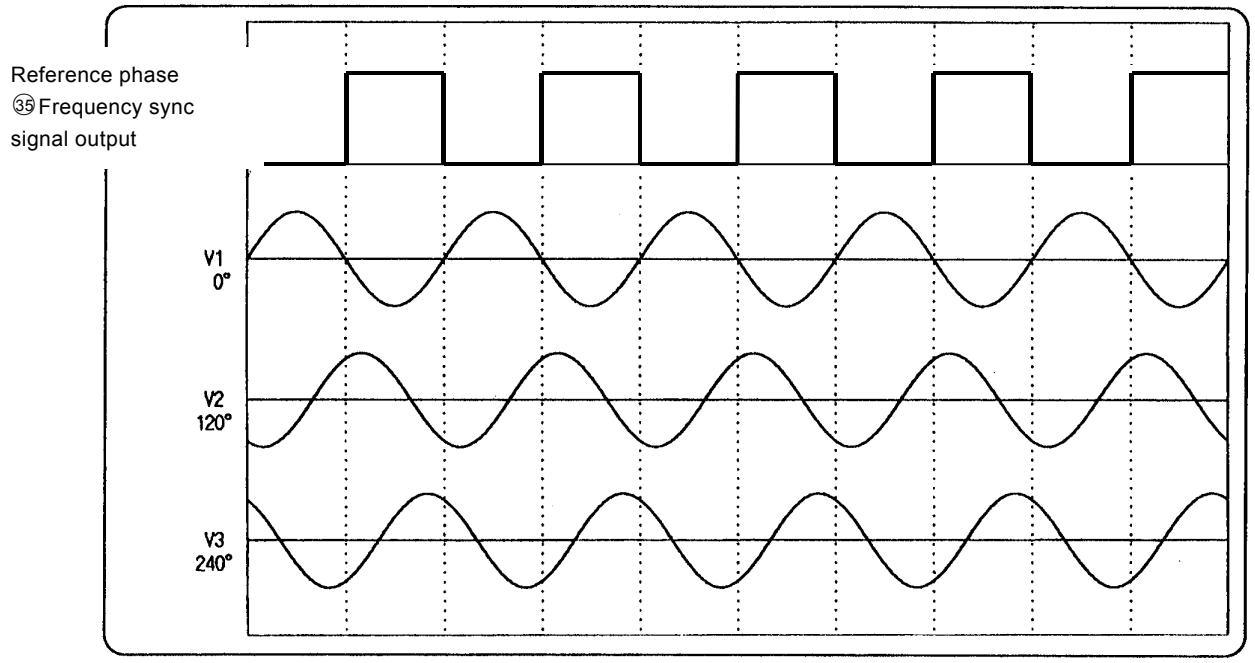


Figure 3-6 Output waveform with setting of V1: 0 °, V2: 120 ° and V3: 240 °

The amplitudes or phases of three channels can be changed with MODIFY simultaneously. The LED is turned on when the cursor is moved to the value you wish to change and INTERLOCK 3 ϕ is pressed, and the amplitude or phase can be changed in all three channels by rotating MODIFY.

In interlock 3 ϕ setting, the phase can be change regardless of the range setting, but the amplitude can not be changed and an error occurs when the ranges of voltage output 1 to 3 are different.

1LG setting

This function automatically sets the conditions for single line-to-ground fault (1LG) in a resistance neutral grounding system by calculation using normal voltages and zero-phase voltage.

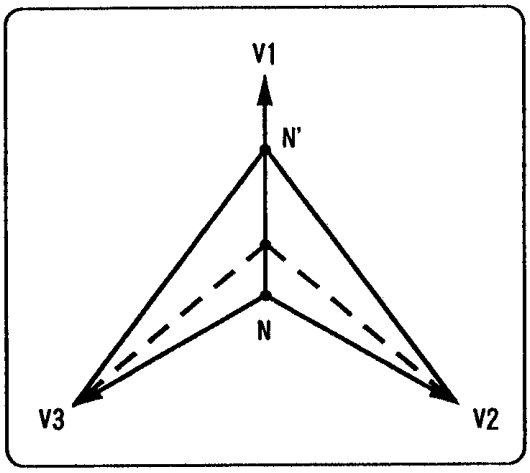


Figure 3-7 1LG setting

The normal value must be set to the balanced 3-phase beforehand. The zero-phase voltage (3Vo) should be set to the value divided by $\sqrt{3}$.

- Setting procedure of the phase voltage 63.5V (line-to-line 110V) and the complete ground fault (3 Vo is 110V) of V1 phase

Set the normal value to 63.5V of the balanced three phase function.

NORMAL V1(V)	NORMAL V2(V)	NORMAL V3(V)
63.50	63.50	63.50
0.0	120.0	240.0
NORMAL ϕ1(°)	NORMAL ϕ2(°)	NORMAL ϕ3(°)

Press SHIFT+1LG SETTING to display the 1LG setting on 【SETTING / DATA】.
Select the ground fault phase with MODIFY. Select [V1] here.

SETTING/DATA
V1 ↵
3Vo 0.000V↵
SETTING/DATA

Move the cursor with ▼ and input 110 with the numeral buttons, and press ENTER to finalize the value of 3Vo.
(The value of 3Vo can be set with MODIFY.)

SETTING/DATA
V1 ↵
3Vo 110.0V↵
SETTING/DATA

When ENTER is pressed in the condition above, the fault value is set to the V1 phase complete ground fault.

FAULT V1(V)	FAULT V2(V)	FAULT V3(V)	SETTING/DATA
0.00	110.00	110.00	V1 ↵
0.0	150.0	210.0	3Vo 110.0V↵
FAULT ϕ1(°)	FAULT ϕ2(°)	FAULT ϕ3(°)	SETTING/DATA

When the amplitude value calculated from the 3Vo value exceeds the range value, an error occurs and setting can not be completed. Set it in the necessary range.

B) 2LS setting

This function automatically sets the conditions for two-line short circuit (2LS) by calculation using normal voltages and the line-to-line voltage to be short-circuited.

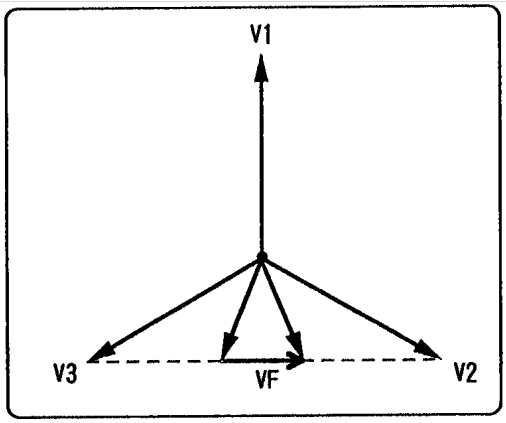


Figure 3-8 2LS setting

The normal value must be set to the balanced 3-phase beforehand.

- Setting procedure of the phase-voltage being 63.5V (line-to-line 110V) and a short circuit made across V2-to-V3 (VF of 60V)

Set the normal value to 63.5V of the balanced 3 ϕ .

NORMAL V1(V)	NORMAL V2(V)	NORMAL V3(V)
63.50	63.50	63.50
0.0	120.0	240.0
NORMAL ϕ 1(°)	NORMAL ϕ 2(°)	NORMAL ϕ 3(°)

Press SHIFT+⑫2LS SETTING to display the 2LS setting on【SETTING / DATA】.
Select the short circuit line with MODIFY. Select [V2-V3] here.

SETTING/DATA
V2-V3 ↵
VF 0.000V↵
SETTING/DATA

Move the cursor with ▼ and input 60 with the numeral buttons, and press ENTER to finalize the VF value.
(The VF value can be set with MODIFY.)

SETTING/DATA
V2-V3 ↵
VF 60.00V↵
SETTING/DATA

When ENTER is pressed in the condition above, the fault value is set to the V2-V3 line short circuit fault (VF is 60V).

FAULT V1(V)	FAULT V2(V)	FAULT V3(V)	SETTING/DATA
63.50	43.68	43.68	V2-V3 ↵
0.0	136.6	223.4	VF 60.00V↵
FAULT ϕ 1(°)	FAULT ϕ 2(°)	FAULT ϕ 3(°)	SETTING/DATA

When the amplitude value calculated from the VF value exceeds the range value, an error occurs and setting can not be completed. Set it in the necessary range.

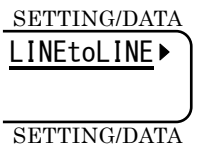
C) Line voltage calculation function

In the 3-phase 4-wire output mode, line-to-line-voltage and zero-phase-voltage are displayed on the【SETTING / DATA】display as the result of calculating from the phase-voltage value and phase value.

- Setting procedure

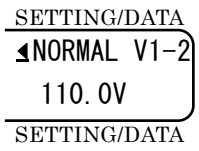
Press SHIFT+⑫OTHER FUNC to display the other function on the 【SETTING / DATA】display.

Rotate MODIFY to select [LINEtoLINE].



Press ▶ to display the **line to line voltage** on the 【SETTING / DATA】, then the calculation result is displayed underneath.

Rotate MODIFY , and the following results are displayed.



[NORMAL V1-2]	normal voltage between V1 and V2
[NORMAL V2-3]	normal voltage between V2 and V3
[NORMAL V3-1]	normal voltage between V3 and V1
[FAULT V1-2]	fault voltage between V1 and V2
[FAULT V2-3]	fault voltage between V2 and V3
[FAULT V3-1]	fault voltage between V3 and V1
[NORMAL V0]	normal voltage at zero-phase
[FAULT V0]	fault voltage at zero-phase

Press ◀ , and the other function is displayed on the【SETTING / DATA】display again.

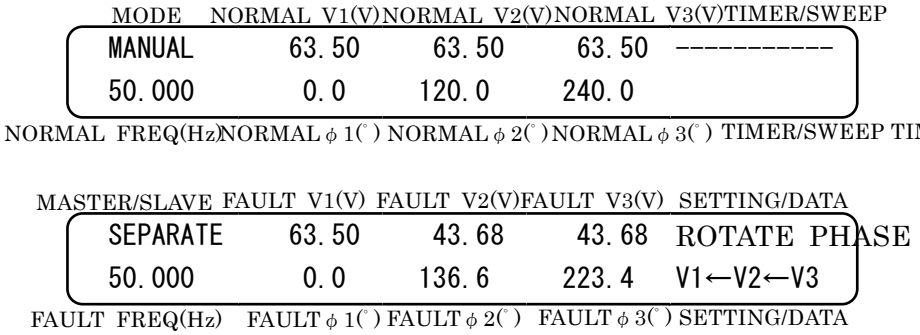
D) Phase rotation

This function changes the set value of the range and amplitude/phase as follows: V1→V2, V2→V3, V3→V1 or V1←V2, V2←V3, V3←V1. When the signal outputs are rotated, outputs are turned off in all outputs.

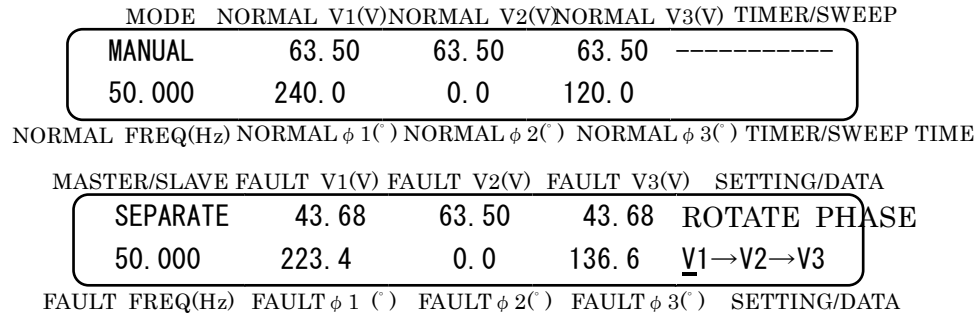
- Setting procedure

  Press SHIFT+OTHER FUNC to display the other function on the【SETTING / DATA】display.

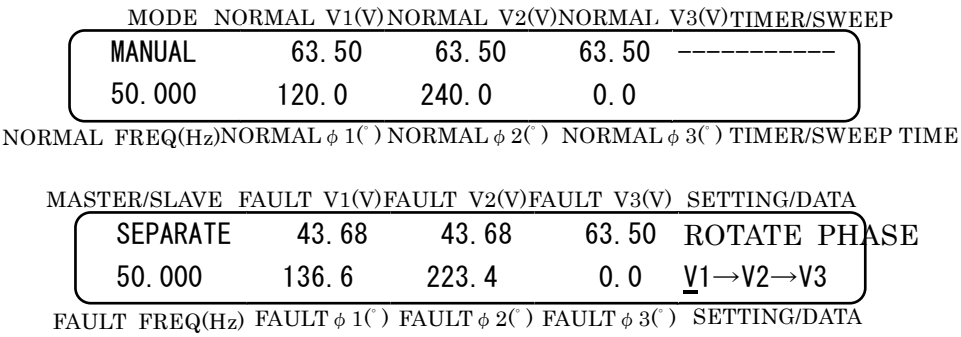
  Rotate MODIFY to select [ROTATE PHASE].



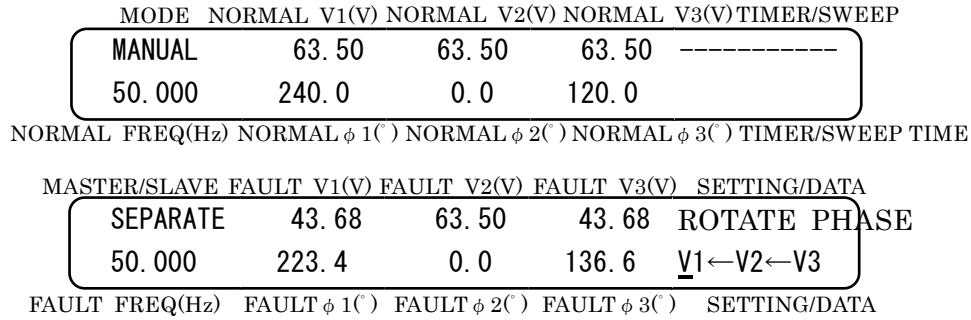
  Move the cursor down with ▼ , and turn MODIFY to the right, and [V1→V2→V3] is displayed and the display values are rotated as V1→V2, V2→V3, V3→V1.



  Rotate MODIFY once again, then, the values are rotated as V1→V2, V2→V3, and V3→V1.



  If MODIFY is rotated to the left, [V1←V2←V3] is displayed and the values are rotated as V1←V2, V2←V3, and V3←V1.

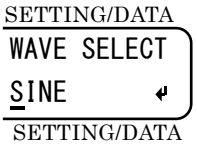


3.4.3 Waveform selection

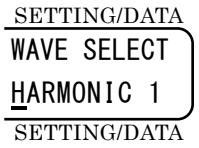
Same waveform is set to all outputs by waveform selection.
A sine wave is set in normal operation, but other waveform may be set in special tests.
When the wave selection is modified, the all outputs will be turned off for safety.

- Setting procedure

  Press SHIFT+⑫ OTHER FUNC to display the wave selection setting on the【SETTING / DATA】display.
  Rotate MODIFY to select [WAVE SELECT].



  Move the cursor down with ▼ and select the wave to be changed by rotating MODIFY, then, press ENTER.



■ Sine wave [SINE]

When [SINE] is displayed on the【SETTING / DATA】display , sine waves are output.
OF ⑩status-display-LED, <HARMONIC ARBITRARY> LED is turned off.

■ Harmonic 1 [HARMONIC 1] ＊1 (Japanese model only)

When [HARMONIC 1] is displayed on the【SETTING / DATA】display, the harmonic-1 are output.
OF ⑩status-display-LED, <HARMONIC ARBITRARY>LED is turned on.
Set the harmonic-1 parameter-data through GPIB or RS-232C in advance.

■ +DC[+DC], -DC[-DC]

This outputs +DC/-DC. <HARMONIC ARBITRARY>LED is turned on and [+DC MODE] / [-DC MODE] is displayed on the【NORMAL FREQ】and【FAULT FREQ】display.
+DC/-DC may be dangerous if handled improperly, and is enabled/disabled by the internal DIP switch.
The menu is not displayed if the internal DIP switch is set to disabled position.

☞"2.2 Setting of internal dip switch"

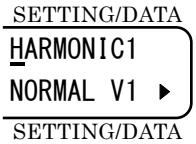
A) Setting of harmonic-1 parameters*1 ＊１（Japanese model only）

Harmonic-1 calculates the waveform from the amplitude value and phase value of the selected harmonic and writes it in the waveform memory to generate the waveform. Therefore, the amplitude and phase of the harmonic can not be changed with the modify dial when harmonic waveform signal has been ouput.
Harmonic-1 parameters set the normal and fault status of each output individually.
The parameters consist of the percentage of the amplitude from first to 25th order (0.0 to 100.0%) and the phase (0-359 °). However, if the waveform obtained as a result of calculation exceeds the 100% of wave crest of the fundamental (first order), an error occurs and the parameters will not be set.
When the harmonic-1 is selected, the output will be turned off if the parameters are changed and calculated.

- Setting procedure

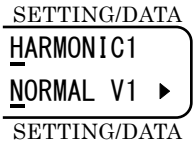
  Press SHIFT+OTHER FUNC to display the other function on the【SETTING / DATA】.

  Rotate MODIFY and select [HARMONIC 1].



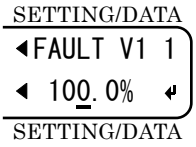
  Move the cursor down with ▼, select one of followings with MODIFY

[NORMAL	V1]	normal voltage 1
[NORMAL	V2]	normal voltage 2
[NORMAL	V3]	normal voltage 3
[FAULT	V1]	fault voltage 1
[FAULT	V2]	fault voltage 2
[FAULT	V3]	fault voltage 3



  And then press ▶.

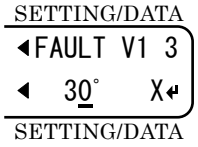
  Then the parameter input is displayed on the【SETTING / DATA】display.
  (The display shown on the right is the example when [FAULT V1] is selected.)



  The number on the upper right shows the order of the harmonic,
  when [%] is displayed, the value displayed is amplitude value, and when [°] is displayed, the value displayed is value of the phase.

  If the cursor is moved up and MODIFY is rotated, the parameter will change as following.
  [1: amplitude]→[1: phase]→[2: amplitude]……[24: phase]→[25: amplitude]→[25: phase]

  Move the cursor down and set the parameter value with the numeral buttons or MODIFY.
  When the parameter value is changed, [X] is displayed on the right of the unit to indicate that the parameter value is changed and the calculation is not carried
  When the change is completed and ENTER is pressed, the calculation is carried [X] will disappear.



When the parameter is displayed on【SETTING / DATA】,【SETTING / DATA】will return to [HARMONIC 1] of the other function if ◀ is pressed.

3.5 Operation mode

RX4718W operates in the several modes depending on the setting.

The Operation mode includes the following 15 modes and the selected operation mode is displayed on the【MODE】display of ⑥⓪.

Manual mode	[MANUAL]
Quick-change mode	[HLD MODE], [NHD MODE]
Operation・recovery simultaneous measurement mode	[OP:RECOV]
Normal sweep	[SWEEP], [1LG SWEEP], [2LS SWEEP],
Search sweep	[SRCH SWP], [1LG SRCH], [2LS SRCH],
DSK search sweep	[DISKSWP], [DISK 1LG SRCH], [DISK 2LS SWP],
Frequency relay (95) test mode	[FREQ RLY]
SOR quick change mode	[SOR MODE]

When the operation mode is changed, the all outputs are turned off for safety.

- Setting procedure

  Press MODE key of ⑥②, and the operation mode is displayed on the【SETTING / DATA】display.

  Select the operation mode you wish to set with MODIFY dial.

  and press ENTER key of ⑤⑤.

SETTING/DATA
MODE
HLD MODE ↵
SETTING/DATA

NORMAL key sets the amplitude output to normal value and FAULT key sets it to fault value.

SWEEP▲, STOP, SWEEP▼ starts and stops sweeping the output value.

The status of the output is confirmed by the LEDs of these operation command keys of ⑤④.

FAULT key function can be set to either Alternate or Momentary mode by PSW mode setting.

■ Setting procedure of PSW mode

Press SHIFT+OTHER FUNC key of ⑥②, the other function is displayed on the【SETTING / DATA】display.

Turn MODIFY dial, and display [PSW MODE] on the【SETTING / DATA】display.

Move the cursor down with ▼.

Turn MODIFY dial, and display [MOMENTARY] or [ALTERNATE] on the【SETTING / DATA】display.

SETTING/DATA
PSW MODE
ALTERNATE
SETTING/DATA

<ALTERNATE>LED of ⑤④ lights up when the PSW mode is [ALTERNATE].

<ALTERNATE>LED of ⑤④ does not light up when the PSW mode is [MOMENTARY].

- When the PSW mode is the Alternate mode, the outputs turn to fault value if FAULT key is pressed.

  And the fault value is kept on even if FAULT key is released.

  In order to return the output to normal value, press FAULT key again or press NORMAL key.

- When the PSW mode is Momentary mode, the outputs turn to fault value if FAULT key is pressed,

  but the output value returns to normal value as soon as FAULT key is released.

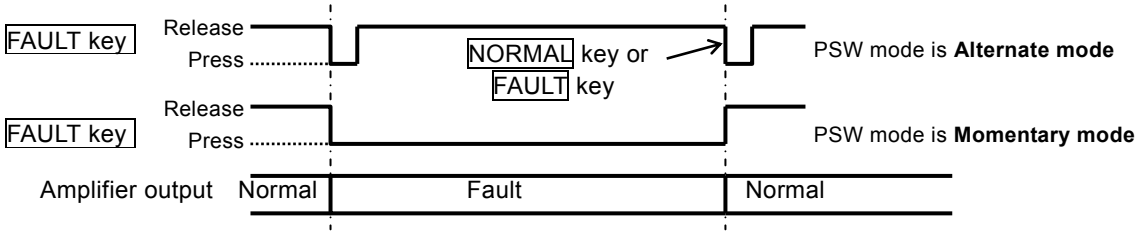


Figure 3-9 Operation of PSW mode

3.5.1 Trip input and operation start input

■ Operation of [TRIP INPUT]

The operation-signal from a protective relay is applied to the [Trip-Input] terminal (① to④).

The input signal of the [Trip-Input] controls operation as below according to the Operation Mode.

Manual mode	no use
Quick change mode	timer measurement and control of normal/fault state
Operation・Recovery simultaneous measurement mode	timer measurement
Normal sweep	stop of sweep (measurement of Operation・Recovery value)
Search sweep	stop of sweep (measurement of Operation・Recovery value)
DSK search sweep	stop of sweep (measurement of Operation・Recovery value)
Frequency relay(95) test mode	Operation・Recovery frequency and timer measurement
SOR quick-change mode	monitor of trip signal ON/OFF

■ Operation of [START INPUT]

In order to externally start the Quick Change/Sweep, the start signal is applied to the [START INPUT] terminals⑤ or ⑥.

The input signal of the [START INPUT] controls operation as below according to the Operation Mode.

Manual mode	no use
Quick change mode	control of Start/Stop of operation
Operation・Recovery simultaneous measurement mode	control of Start/Stop of operation
Normal sweep	start of operation only
Search sweep	no use
DSK search sweep	no use
Frequency relay (95) test mode	start of operation only
SOR quick-change mode	start of operation only

⚠ Caution

- When the Operation Mode is set for quick change mode and Operation/Recovery simultaneous measurement mode:

  Quick change starts with the [START INPUT] signal (level-low), and the Fault output value returns to Normal value with [START INPUT] signal recovery (level-high).

  Therefore, when the [START INPUT] signal contains chattering, as the signal is considered to be removed instantly, the output value (Fault value) returns to Normal value immediately. No chattering shall be contained in the operation [START INPUT] signal.

  If chattering cannot be removed, recovery function of the operation [START INPUT] signal can be set to disable.

  ☞"3.5.1.D) Stop Function of operation start input "

  This setting prohibits returning output value (Fault value) to Normal value with chattering, so, the following procedure is necessary for returning to Normal value.

  When PSW mode is the Alternate mode, press NORMAL or FAULT key.
  When PSW mode is Momentary mode, release FAULT key.

A) Setting of [TRIP INPUT] logic

In standard operation, RX4718W takes a trip-signal of Voltage-Apply (or short-contact = "a" contact) as a trip-operation, and a trip-signal of Voltage-Remove (or open-contact = "b" contact) as a trip-recovery.
The standard setting is [↑ a : RISE] and the reverse setting is [↓ b : FALL].

The setting procedure is as follows.

SHIFT+⑫TRIP :b can change [↑ a :RISE] and [↓ b : FALL] alternatively.
When [↑ a : RISE] is selected, ⑩<TRIP: b>LED on the front panel is turned off.
When [↓ b : FALL] is selected, ⑩<TRIP: b> LED on the front panel is turned on.

- Setting procedure

⑫TRIP:b key alternates [↑ a :RISE] and [↓ b : FALL] setting.
With [↑ a : RISE] setting, the ⑩<TRIP: b> and TRIP: b of ⑫ on the front panel will be turned off.
With [↓ b : FALL] setting, the ⑩<TRIP: b> and TRIP: b of ⑫ on the front panel will be turned on.

Confirm your setting according to the following principles:

When the protective relay operates and a signal is produced (the voltage changes from Low to High or the contact changes from short-circuit to open), [↑ a : RISE] setting is selected and the ⑩< TRIP: b > LED turns off.

When the protective relay operates and the signal is removed (the voltage changes from High to Low or the contact changes from short-circuited to opened), [↓ b : FALL] is selected and the [TRIP: b] LED turns on.

⑩<TRIP INPUT> of character indication LED on the front panel lights up whenever voltage is applied (contact is short-circuited) regardless of setting.

B) Setting of trip input chattering correction function

In case of testing a mechanical protective relay, chattering may be contained on a contact changing occasion, which makes it difficult to determine the trip-operation point.
Therefore, RX4718W is provided with chattering correction function to ease determination of the trip-operation point. If a value is set in the chattering correction function, the system concludes that the signal is changed when no chattering has been found for the set time period after the signal change.
When the chattering correction function is turned [on], the timer measurement value is corrected by the chattering correct time. ☞"3.5.3.A) Timer"

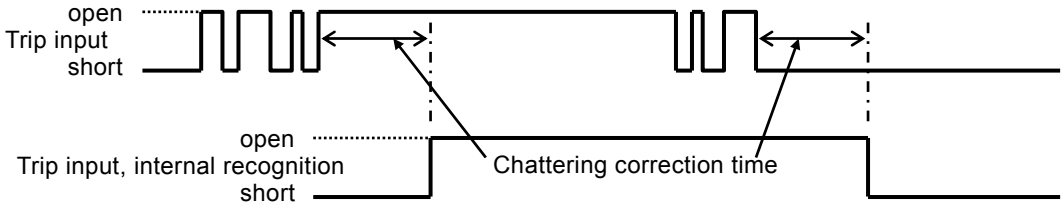
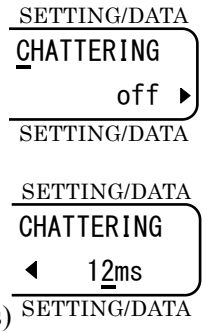


Figure 3-10 Operation of Chattering Correction Function

- Setting procedure

Press SHIFT+OTHER FUNC key of ⑫ and display the other function on the 【SETTING / DATA】 display.
Rotate MODIFY dial and select [CHATTERING].
Move the cursor down with ▼, and rotate MODFIY dial to select [on]
[off] : (<CHATTERING> of ⑩ on the front panel will light off),
[on] :(<CHATTERING> of ⑩ on the front panel will light on) and press ▶.
Set the chattering correction time with the numeral buttons or MODIFY dial. (1-100ms)



C) Setting of operation start input logic

In standard operation, RX4718W takes an operation start input of voltage application (or contact short-contact) as a start trigger signal, and an operation start input of voltage removal (or open-contact) as a trip-recovery.

A sign of [↑a : RISE] indicates voltage application (or contact short-contact) as a start operation.

A sign of [↓ b : FALL] indicates voltage removal (or open-contact) as a trip-recovery.

Standard setting displays [↑a : RISE], and inverted setting displays [↓ b : FALL].

- Setting procedure

  Press SHIFT+OTHER FUNC of ⑫ to display the other function on the【SETTING / DATA】display.

  Rotate MODIFY and select [START INPUT].

  Move the cursor down with ▼ and turn MODIFY to select

  [↑a : RISE] (<START: b> LED of ⑩ on the front panel will light off),

  [↓ b :FALL] (<START: b> LED of ⑩ on the front panel will light on).

SETTING/DATA
START INPUT
↑a RISE
SETTING/DATA

< START INPUT> LED of ⑩ on the front panel lights up whenever voltage is applied (contact is short-circuited) regardless of setting.

D) Stop Function of operation start input

In standard operation, output signal of RX4718W are changed to the fault state by the operation start input of voltage application (or contact short-contact).

Recovery to the normal state of output signal of RX4718W by the voltage removal (or open-contact) of an operation start input can be set to enable/disable.

Select " on " when the user wishes to use the Stop-Function, and selects " off " when not to use the Stop-Function.

- Setting procedure

  Press SHIFT+OTHER FUNC key of ⑫, and the other function is displayed on the【SETTING / DATA】display.

  Rotate MODIFY dial to select [STOP FUNC].

  Move the cursor down with ▼, and turn MODIFY dial,

  and select [on] or [off].

SETTING/DATA
STOP FUNC
off
SETTING/DATA

■ [on]

When the Stop-Function is [on], if an operation start input turns to voltage removal (or open-contact), the Stop-Function is carried out. And the output signal will return to normal state from fault state.

This is available when the operation mode is as follows.

Quick change mode
Simultaneous operation/recovery measurement mode

When the operation mode is neither of the above mode, the Stop-Function is not available even if [on] is set

■ [off]

When the Stop-Function is [off], even if an operation start input turns to voltage removal (or open-contact), the Stop-Function is not carried out. And the output will not return to normal state.

When the Stop-Function is [off], in order to return to normal state, perform the following procedure.

When PSW mode is alternate, press NORMAL or FAULT key.

When PSW mode is momentary, release FAULT key.

3.5.2 Operation of manual mode

Use manual mode to check general operation of a protective relay. This is not affected by the trip input or operation start input. In addition, the timer does not work. However NORMAL and FAULT key control allow setting the amplifier output for normal and fault state.

In manual mode, trip-input or operation start input does not affect the operation. However, the LED of <TRIP INPUT> and <START INPUT> on the panel can be used to monitor the input signal status.

Therefore, the operation/recovery point of a protective relay can be measured by changing the settings while observing the LED on the panel.

3.5.3 Operation of quick change mode

Quick-change mode is used to measure the operation time (dynamic characteristics) of a protective relay. The response time of trip signal is measured by quickly changing the RX4718W output from the normal to fault values.

The quick-change mode includes the **hold quick change** [HLD MODE] and non-hold quick change [NHD MODE].

The functions of fault duration, pre-trigger time and fault start phase are effective in this mode only.

Start-command will be triggered by pressing FAULT key of ⑭ or Operation start input signal⑤,⑥.

Recovery-command will be triggered by pressing NORMAL, FAULT key of ⑭ (depending on the PSW mode setting), Operation start input⑤,⑥ (when the Stop-Function is " on ") and Fault duration (when the function is " on ").

■ Hold quick change

[HLD MODE]: This simulates a permanent fault ("HLD" stands for "hold")

Start-command (FAULT⑭ key, or Operation-start-input⑤,⑥) causes the Amplifier output to quickly change to the Fault state.

↓

When **Auto-Recovery** of the timer setting is " ON ", and the timer mode is [INTERVAL] or [SEP.TIMER], Fault-state returns to normal state at the timing of the first rising edge of trip signal (one of ①to④).

When **Auto- Recovery** of the timer setting is "ON", and the timer mode is [ONE-SHOT], fault state returns to normal state at the timing of the first falling edge of trip signal (one of ①to④).

When **Auto-Recovery** of the timer setting is " OFF ",even if the trip signal is applied, Fault-state does not return to normal state.

↓

Thereafter, any change of trip signal (one of ① to ④) does not change the normal state of the amplifier output.

↓

Recovery-command only can turn fault state of amplifier output to normal state, and thereafter amplifier-output can not be changed by change of trip signal.

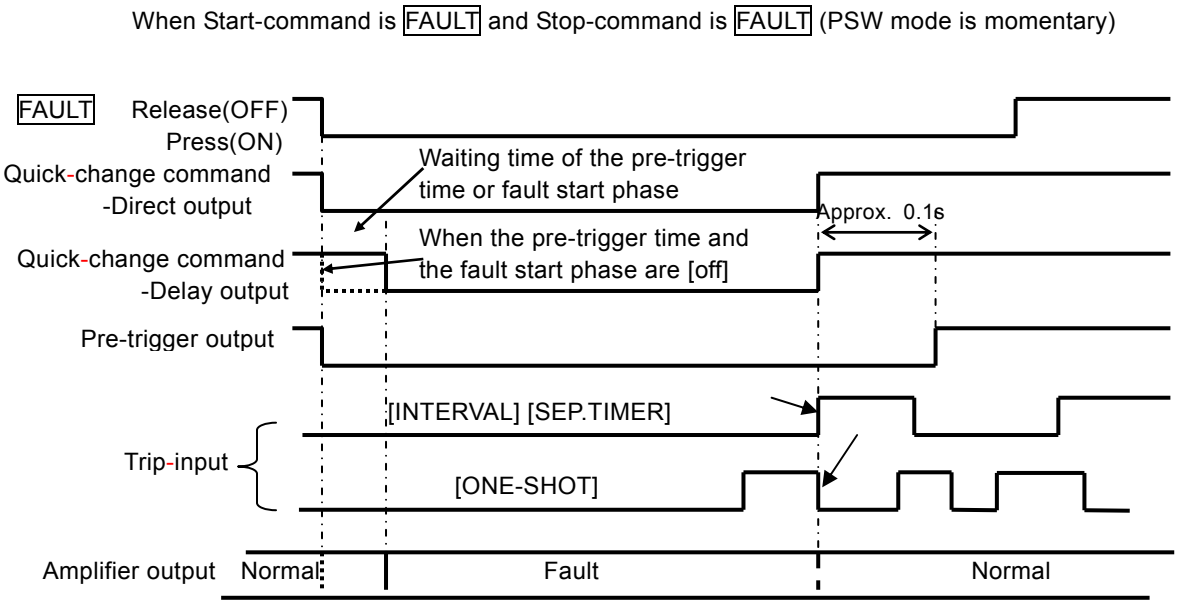


Figure 3-11 Operation of Hold-Quick-change when the Auto-return of the timer menu is [ON]

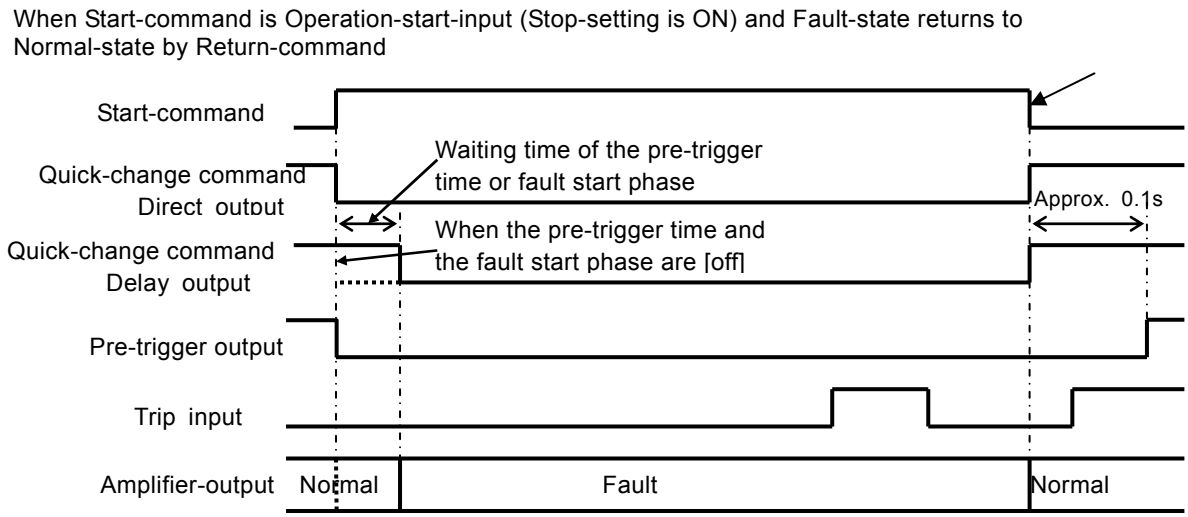


Figure 3-12 Operation of Hold-Quick-change when the Auto-return of the timer menu is [OFF]

■ Non-hold quick change

[NHD MODE]: This simulates Arc-fault (NHD stands for non-hold).

Start-command (FAULT ㊹ key, or operation start input ⑤, ⑥) causes the amplifier output to quickly change to the fault state.

↓

When trip signal (one of ①to④) turns to "ON", fault state returns to normal state.

↓

When trip signal (one of ①to④) returns to "OFF", normal state turns to fault state again.

↓

Just like the above mentioned, amplifier output alternates normal state and fault state according to trip signal state of "ON/OFF".

↓

With an operation stop command, the output becomes normal, and thereafter, any change in the trip signal does not change the output.

Return-command only can turn fault state of amplifier output to normal state, and thereafter amplifier output can not be changed by change of trip-signal.

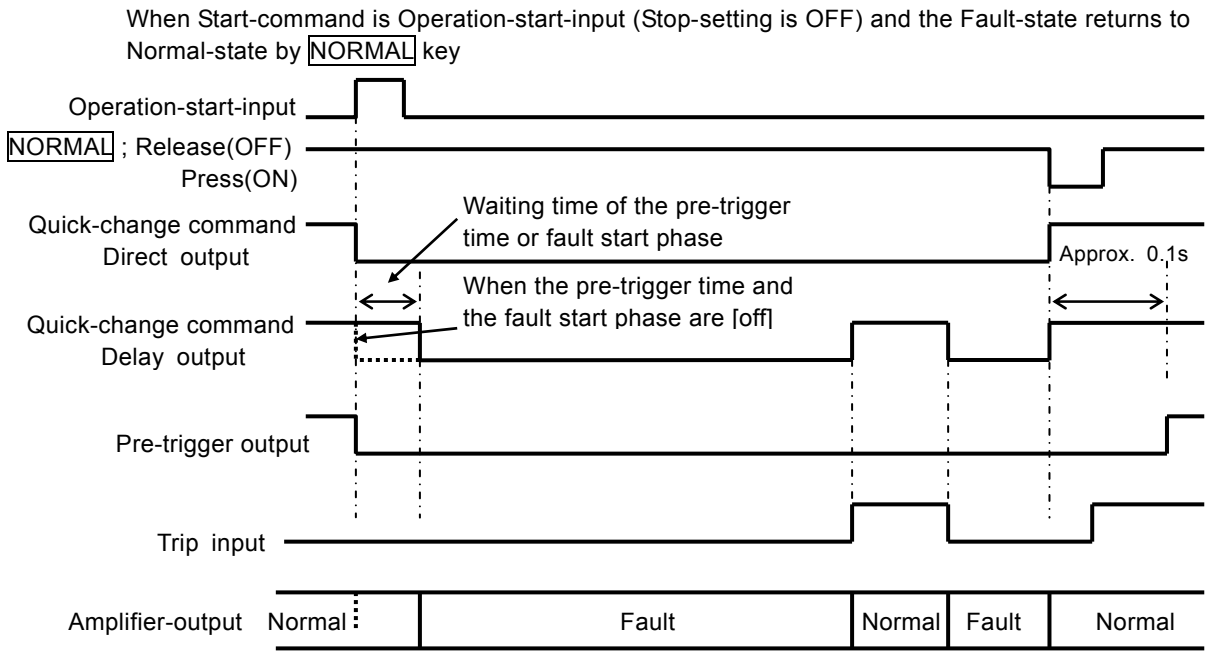


Figure 3-13 Operation of Non-Hold Quick-change

A) Timer

In quick change mode, the timer is used to measure operation-time of protective relay.

There are several timer-measurement modes in [HLD MODE] and [NHD MODE].

In [HLD MODE] : [INTERVAL], [ONE-SHOT] and [SEP.TIMER]

In [NHD MODE] : [INTERVAL] and [TRAIN]

- Setting procedure

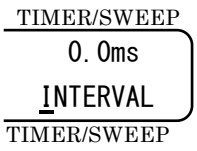
  By MODE ⑫key, 【SETTING / DATA】 display is set to [Operation-Mode].

  By MODIFY key, set 【SETTING / DATA】 display to [HLD MODE] ,

  and Timer-mode is displayed on 【TIMER/SWEEP】 display.

  Move the cursor to 【TIMER/SWEEP】 ⑩display with ▲、▼、◀、▶

  and turn MODIFY to set Timer-measurement mode.



Measurements of INTERVAL, ONE-SHOT and TRAIN are as follows.

A: [INTERVAL], duration-time from fault Quick-change to Trip-input-operation

B: [ONE-SHOT], duration-time from Trip-input-operation(ON) to Trip-input-recovery(OFF)

B+C+D+E…: [TRAIN], a total of Trip-input-operation-time

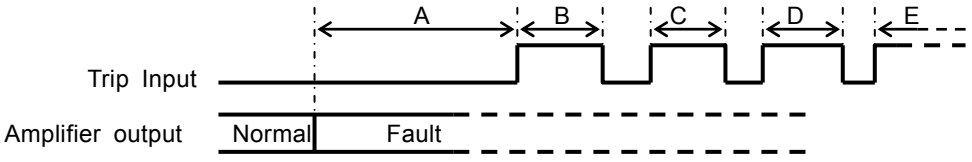


Figure 3-14 Measurement detail of INTERVAL, ONE-SHOT and TRAIN

Start-measure [SEP. TIMER] measures the time from the operation start input to the trip input.

Start-measure [SEP. TIMER] is defined by the duration from the point of pressing FAULT ⑭key to Trip-input ON.

A: Start measurement[**SEP TIMER**]

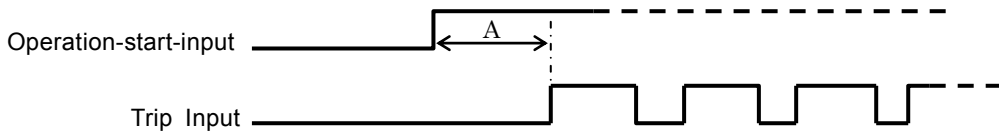


Figure 3-15 Measurement detail of SEP.TIMER

In Start-measure [SEP. TIMER], only pressing FAULT key is available as the operation start command.

The "start input" signal⑤,⑥ is not available as the operation start command.

■ Auto-reset setting by timer menu

Auto-reset to normal state of amplifier output is available only in the mode of [HLD MODE].

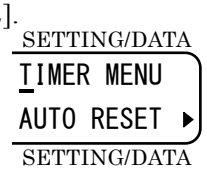
Press SHIFT+OTHER FUNC key, and display the other function on the 【SETTING / DATA】 display.

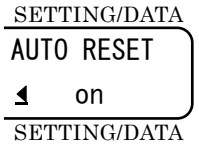
Rotate MODIFY dial and select [TIMER MENU].

Move the cursor down with ▼,

and turn MODIFY dial to select [AUTO RESET], then, press ▶.

Select [on] or [off] with MODIFY.





- When [AUTO RESET] is selected, if Trip-input is turned to " ON "-state, amplifier output turns to normal state from fault state. Auto-reset of [on] is selected usually.
- When Auto-reset of [off] is selected, ON/OFF-state of the trip-input does not turn amplifier output to normal state, and amplifier output keeps on fault state

  Recovery-command (operation stop command: refer to 3-5-3) only can turn the amplifier output to normal state. Use this setting if the user wants to prevent the output from changing to normal state in measurement of a Fluctuation-range relay

■ Timer measurement value

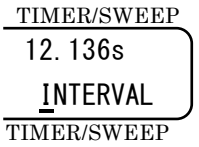
A timer measurement value is displayed on ⑥⓪【TIMER/SWEEP】display. The timer automatically selects one of the following three ranges depending on the measurement time.

(If 999.99s is exceeded, measurement becomes disabled, showing an error message.)

0.0-9999.9ms

10.000-99.999s

100.00-999.99s



To clear the timer measurement value, [AUTO] and [MAMUAL] CLEAR are available.

[MAMUAL]: The timer is reset by pressing TIMER CLR ⑤①key.

[AUTO] : The timer is reset automatically by every Start-command input in setting [TIMER CLR] - [AUTO] on the 【SETTING / DATA】 display.

[AUTO] can work in the following timer modes.

In [HLD MODE] : [INTERVAL] and [SEP.TIMER]

In [NHD MODE] : [INTERVAL]

In the following timer modes, Timer is reset by only TIMER CLR key even if [AUTO] is set.

In [HLD MODE] : [ONE-SHOT]

In [NHD MODE] : [TRAIN]

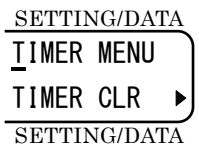
- Setting procedure for TIMER CLEAR in TIMER MENU

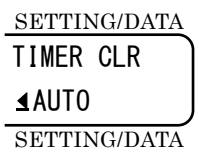
  Press SHIFT+OTHER FUNC key to display the other function on 【SETT DATA】 display.

  Rotate MODIFY to select [TIMER MENU].

  Move the cursor down with ▼ and turn MODIFY to select [TIMER CLR], then, press ▶.

  [AUTO] or [MANUAL] is selected by MODIFY.





■ Correction of timer measurement value using the trip input chattering correction function [ON]

When the chattering correction function is "OFF", timer measurement starts to count at the first change of trip input signal chattering.

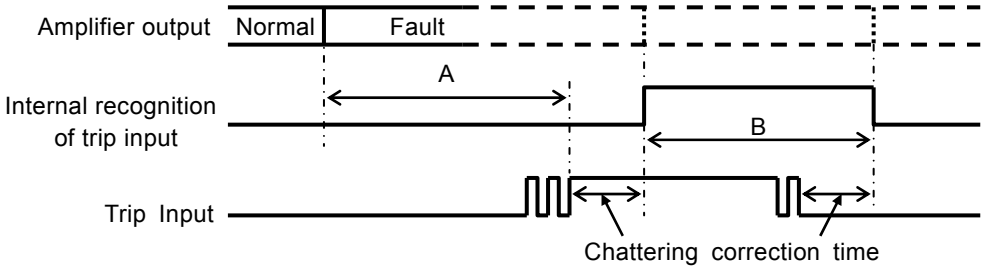
If the user wishes to start timer measurement after the trip input signal change becomes stable, set the chattering correction function "ON].

☞“3.5.1.B) Setting of trip input chattering correction function“

When the chattering correction function is turned "ON", the measurement value is corrected as below, and the corrected value is displayed as a timer measurement value.

A: Corrected timer measurement value in [INTERVAL] or [SEP.TIMER] setting

B: Corrected timer measurement value in [ONE-SHOT] setting



Timer measurement values are not corrected in [TRAIN] setting.

Figure 3-16 Timer measurement values when the trip input chattering correction function is [on]

B) Fault duration

When fault duration is set to "ON", amplifier output is forced to return to normal state from fault state after the set-time goes by

This function is used when the user does not want to leave amplifier output fault state for a long time.

- Setting procedure

  Press SHIFT+DURATION key of ㉜ to display the fault duration on the【SETTING / DATA】display.

  Rotate MODIFY dial and select [on] or [off] of the function.

  When the function is turned [on],

  <FAULT DURATION>㊿LED on the front panel will light on.

  Move the cursor down with ▼, and use the numeral buttons

  or MODIFY dial to set the fault duration time.

  (0.001-65.000s)

SETTING/DATA
DURATIONoff
1.000s
SETTING/DATA

SETTING/DATA
DURATION on
5.000s
SETTING/DATA

Only when operation mode is quick change mode, the fault duration function works well, and <FAULT DURATION> LED will light on.

Set the fault duration time a little longer than the expected measurement time. Even if the measurement does not come to an end, the amplifier output returns to normal state from fault state when the fault duration time goes by.

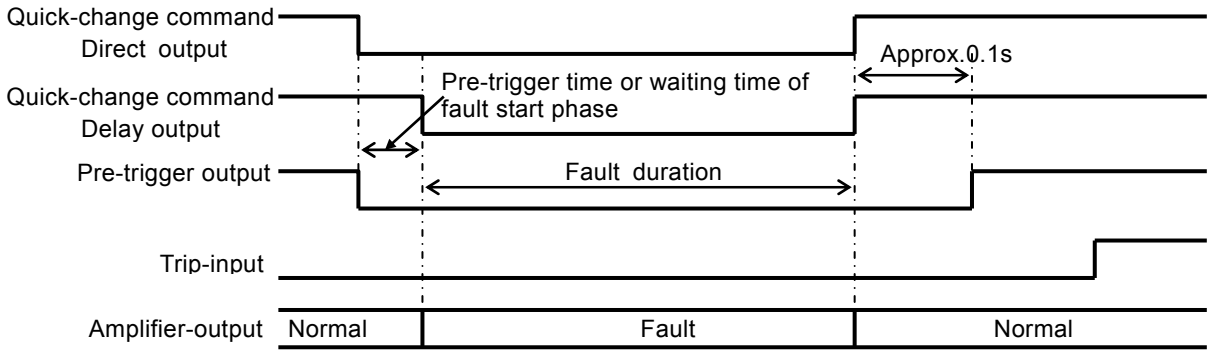


Figure 3-17 Operation of Fault-duration

C) Pre-trigger time and fault start phase

Pre-trigger time (fault delay time) sets the delay time from fault-start-command to an actual quick change of the amplifier output.

This function is useful in setting paper feeding time of the mechanical oscilloscope recorder, or in adjusting transfer-time of the Opposed-test.

- Setting procedure of pre-trigger time

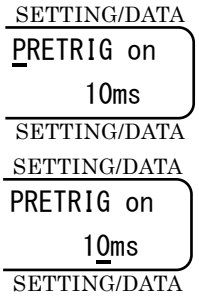
  Press SHIFT+OTHER FUNC key of ㊷ to display the pre-trigger time on the 【SETTING / DATA】 display.

  Rotate MODIFY dial and select [PRETRIG] of the function.

  Move the cursor down with ▼ and select [on] or [off] of the function by rotating MODIFY.

  When the function is turned [on], <PRETRIG> on the front panel lights on.

  Press ▶ and use the numeral buttons or MODIFY to set the pre-trigger time.(10～6000ms)



A fault-start-phase is the phase value when the amplifier-output quickly changes to fault state after the fault-start-command input. The setting value is set as the phase-delay in relation to the reference phase.

☞ "3.4.1.A) Refernce phase and frequency synchronization signal input/output"

- Setting procedure of Fault-start-phase

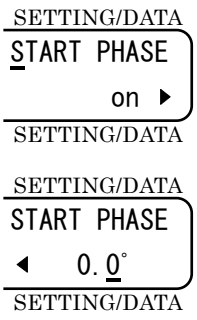
  Press SHIFT+OTHER FUNC to display the other function on the 【SETTING / DATA】.

  Rotate MODIFY to select [START PHASE].

  Move the cursor down with ▼ and turn MODIFY to select [on] or [off] of the function.

  When the function is turned [on], <START PHASE>LED of ㊿ on the front panel will light on.

  Press ▶ and select the fault-start-phase with the numeral buttons or MODIFY. (0.0-359.9 °)



Only in quick-change-mode, both function of pre-trigger time and fault-start-phase are available.

When other mode but quick-change-mode is set, <PRETRIG> and <START PHASE>LED on the front panel will light off, both function of pre-trigger time and fault-start-phase does not work.

The delay of fault-quick-change (quick-change-command delay output) in relation to the fault-start-command (quick-change-command direct output) is different each other according to setting of [on] or [off] of the pre-trigger function and fault-start-phase function.

Both [off]	no delay
Pre-trigger only [on]	quick-change occurs after the pre-trigger-time elapses.
Fault-start-phase only [on]	quick-change occurs at the fault-start-phase timing.
Both [off]	quick-change both function of pre-trigger time and fault-start-phase occurs at the fault-start-phase timing after the pre-trigger-time elapses.

- Quick-change timing for Pre-trigger time of [on] 45ms and Fault-start-phase of [on] 270.0 °

MODE	NORMAL V1(V)	NORMAL V2(V)	NORMAL V3(V)	TIMER/SWEEP
HLD MODE	100.00	100.00	100.00	0.0ms
50.000	120.0	240.0	0.0	INTERVAL

NORMAL FREQ(Hz)	NORMAL φ 1(°)	NORMAL φ 2(°)	NORMAL φ 3(°)	TIMER/SWEEP
MASTER/SLAVE	FAULT V1(V)	FAULT V2(V)	FAULT V3(V)	SETTING/DATA
SEPARATE	50.00	50.00	50.00	START PHASE
50.000	120.0	240.0	0.0	◀ 270.0°

FAULT FREQ(Hz)	FAULT φ 1(°)	FAULT φ 2(°)	FAULT φ 3(°)	SETTING/DATA

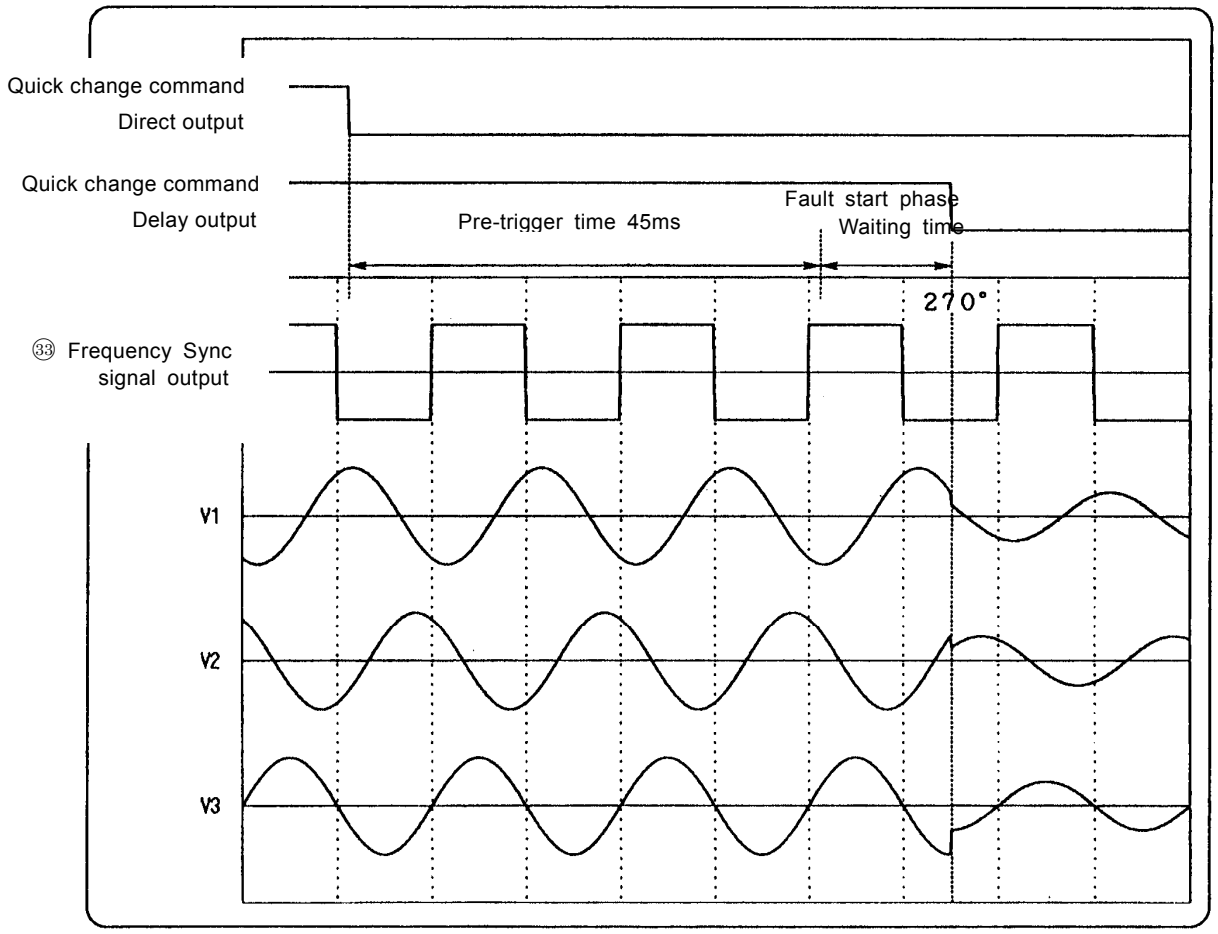


Figure 3-18 Typical quick change start timing when pre-trigger time and fault start phase are [on]

When the pre-trigger time and fault-start-phase are both set to [on], quick-change takes place when the internal reference phase comes to 270° after 45ms of pre-trigger time setting of the fault-command.

Therefore, the time period from the fault-start-command to quick-change occurrence varies within the maximum of one waveform (0 to 20ms for 50Hz) depending on the timing between the fault-command and internal reference-phase.

The set value of V1 phase is 120 ° and the quick change occurs the V1 phase id 150 °. Similarly, V2 is 30 ° and V3 is 270 °.

3.5.4 Simultaneous operation/recovery measurement mode

The simultaneous Operation/Recovery measurement mode allows the user to measure the operation-time and the recovery-time by a single try.

The operation-start-command is triggered by ⑭FAULT key or [START INPUT] input of ⑤⑥ .

The operation-stop-command is given by ⑭NORMAL or ⑭FAULT key (depending on the PSW mode setting) or Start-input⑤⑥ (when Stop-setting is "ON").

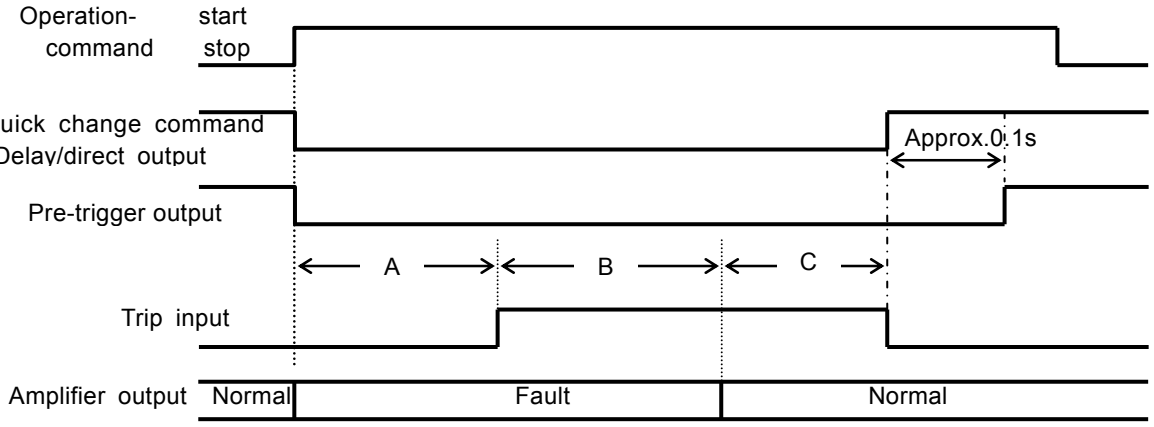


Figure 3-19 Operation of simultaneous operation/recovery measurement mode

Amplifier-output is turned to fault-state from normal-state with operation-start-command, and operation-time is defined as duration time from operation-start-command point to trip-input.

" A " described in Fig 3-16 is operation-time.

↓

" B " described in Fig 3-16 is fault wait time set in advance.

Fault state of amplifier output goes on till **elapse of the** fault wait time " B " in order to make the relay completely trip-status.

↓

Just after **the** fault wait time " B " has passed, amplifier-output is turned to normal-state from fault-state, recovery-time of trip-input (=Protection-relay-recovery-time) is measured.

" C " described in Fig 3-16 is recovery-time.

- Setting procedure of fault-wait-time

  When the simultaneous Operation/Recovery-measurement mode is selected, or SHIFT+WAIT TIME ⑫ key is pressed, fault-wait-time can be set on the【SETTING / DATA】display.
  Move the cursor down with ▼ and set fault-wait-time with the numeral buttons or MODIFY. (0.01-9.99s)

SETTING/DATA
WAITING TIME
0.01s
SETTING/DATA

In simultaneous Operation/Recovery-measurement mode, only [INTERVAL] measure is available for the timer mode.

Since the measurement value is reset at every operation-command input, you can try to operate next measurement without pressing TIMER CLR key.

The measurement result is displayed on the【SETTING / DATA】display.

SETTING/DATA
TS:1252.2m ←Operation time(ms or s)
TR:10.759s ←Recovery time(ms or s)
SETTING/DATA

3.5.5 Operation of normal sweep

The normal sweep is used to measure the operation-value (static characteristics) of a protective relay.
The amplifier-output changes continuously from the normal value to the fault value (trip-operation value measurement) and from the fault value to the normal value (recovery-operation value measurement).

- Items subject to sweep

  Three parameters of Frequency, Amplitude and Phase can be swept.

  But if the same value is set for normal-state and fault-state, amplifier output value of the items does not change.

  The fault value must be set to the more/less value that protective relay works well completely.

  Normal sweep includes three operation modes described below.

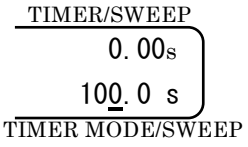
  [SWEEP] sweeps the sweep item linearly.

  [1LG SWP] sweeps keeping the 1LG setting of the amplitude value and phase value.
  Make the fault value 1LG setting beforehand. ☞"3.4.2 0 1LG setting"

  [2LS SWP] sweeps keeping the 2LS setting of the amplitude value and phase value.
  Make the fault value 2LS setting. ☞"3.4.2 B) 2LS setting"

- Setting of sweep time

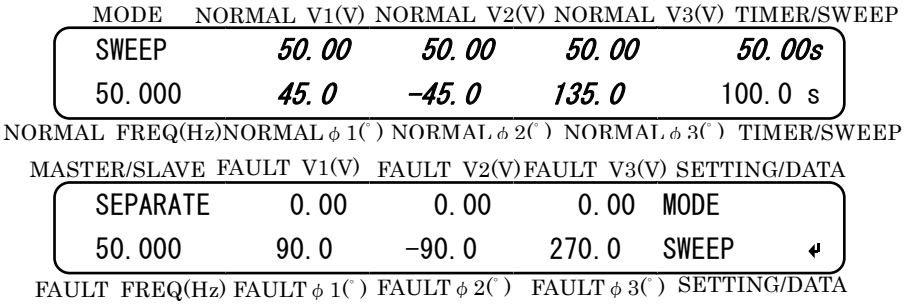
  When the operation-mode is normal-sweep, the sweep-time is displayed on the 【TIMER MODE/SWEEP TIME】 display.
  Move the cursor to the 【TIMER MODE/SWEEP TIME】 display with ▲, ▼, ◀ and ▶ ,
  and set the sweep-time with numeral buttons or MODIFY. (1.0-1000.0s)



The elapsed time of sweep is displayed on the 【TIMER/SWEEP】 display.
For the manual sweep mode, set the elapsed time of sweep here.
When [100.0s] is set as sweep time on the 【TIMER/SWEEP】 display, the relationship between the displayed time and the output value is as follows.

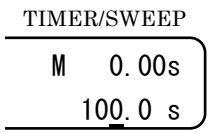
[0.00s]: normal value
[***50.00s***]: middle value of normal value and fault value
[100.00s]: fault value

The output value is displayed on 【NORMAL FREQ】【NORMAL VOL・PHASE 1-3】.
The following example is a display at the elapsed time of 50sec. when the normal frequency is 50.000Hz, the normal voltages 1-3 are 100.00V and the normal phase 1-3 difference are 0.0°.



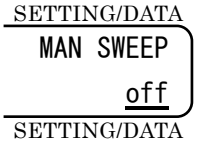
The phase sweeps in the delay-direction when the fault value of phase is bigger than the normal value of phase, and in the lead-direction when smaller.

In Normal-sweep, Automatic-sweep and Manual-sweep are available.
In Manual-sweep, " M " is displayed on the【TIMER/SWEEP】display.



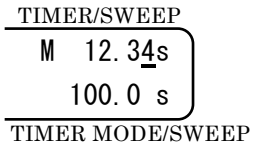
- How to set either Automatic-sweep or Manual-sweep
  When automatic sweep is set, the LED of MANUAL SWEEP is turned off. To change the setting from the manual sweep to automatic sweep, press MANUAL SWEEP.
  When manual sweep is set, the LED of MANUAL SWEEP is turned on and " M " is displayed in the line head of the sweep position. Press MANUAL SWEEP to change the setting from the automatic sweep to manual sweep.

- How to set either Automatic-sweep or Manual-sweep
  Press SHIFT+OTHER FUNC key to display the other function on the 【SETTING / DATA】display.
  Rotate MODIFY and select [MAN SWEEP].
  Move the cursor down with ▼ and turn MODIFY to select [off] / [on].
  [off] : Automatic-sweep
  [on] : Manual-sweep



A) Manual sweep

In Manual-sweep, if the elapsed time of sweep is set at the【TIMER/SWEEP】display,
Amplifier-output values of parameters (Frequency, Amplitude, phase) are output in proportion to the elapsed time setting.
And Amplifier-output values is also displayed on the Upper-display⑥⓪.
In order to set elapsed time,
move the cursor to 【TIMER/SWEEP】 with ▲, ▼, ◄ and ►,
and set elapsed time with the numeral buttons or MODIFY dial.



In the Manual-sweep, Operation-command and Operation-start-input is not valid, but the Trip-input state can be monitored with the <TRIP INPUT>LED on the front panel.
Therefore, the Operation/Recovery values of protective relay can be measured by monitoring the <TRIP INPUT>LED.

B) Automatic sweep

In Automatic-sweep, Sweep-time is the time that is necessary to sweep from normal-state value to fault-state value or from fault-state value to normal-state value.

An Sweep-start-command is given by SWEEP▲/SWEEP▼㊹ or [START INPUT]⑤⑥ .
An Sweep-stop-command is given by NORMAL, FAULT and STOP key.

■ Sweep operation example from the normal value to the fault value

The sweep from normal-state value to fault-state value is used to find trip-operation point of the protective relay, so the trip-input signal needs to be in the normal status when the sweep starts.

- Press ㊹NORMAL key to make Amplifier-output value to normal-state value.
  Trip-input of ①to④ needs to be in the normal-status at this time.
- Press ㊹SWEEP▼ or perform the ⑤⑥Operation-start input, and Amplifier-output value sweeps from normal to fault. (LED of ㊹SWEEP▼ will light on.)
- Press ㊹STOP, and the sweep will stop, and LED of STOP will light on.
  And Amplifier-output value is the then value.

- Press SWEEP▼ again or perform ⑤⑥Operation-start input to sweep to fault-state value direction. (LED of SWEEP▼ will light on.)
- When [TRIP INPUT] signal turns "ON", the sweep stops (LED of STOP key will light on).
  The Amplifier-output value displayed on the ⑥⓪Upper-fluorescent-display at this time is an Operation-value of the protective relay.

■ Sweep operation example from the fault value to the normal value

The sweep from fault-state value to normal-state value is used to find Recovery-point of the protective relay, so the Trip-input needs to be in the operation-status ("ON") when the sweep starts.

- Set PSW mode for [ALTERNATE], and press FAULT key to set Amplifier-output value to Fault-state value. Trip-input is turned "ON" at this time
- Press ㊹SWEEP▲ or perform the ⑤⑥Operation-start input, and Amplifier-output value sweeps from Fault to Normal. (LED of SWEEP▲ ㊹will light on.)
- When Trip-input turns to normal-status ("OFF"), the sweep stops (LED of STOP will light on).
  The Amplifier-output value displayed on the ⑥⓪Upper-fluorescent-display at this time is a Recovery-value of the protective relay.

3.5.6 Operation of Search / DSK-Search sweep

In normal sweep mode, if the sweep rate is too fast, the measurement result of Operation/Recovery time of protective relay may have a large margin of error.

In order to assure more correct measurement, Search/DSK-search sweep modes can be available to cover the above drawback.

The sweep parameters (Frequency, Amplitude, Phase), the sweep-time and the sweep-direction of the phase are same as those described in "3.5.5 Operation of normal sweep".

Search sweep mode is used to measure a protective relay with fast operation time. It includes three operation modes described below.

[SRCH SWP]	sweeps the sweeping items linearly.
[1LG SRCH]	sweeps keeping the 1LG setting of the amplitude value and phase value.
[2LS SRCH]	sweeps keeping the 2LS setting of the amplitude value and phase value.

DSK search sweep is used to measure a protective relay with slow operation time such as a disk type. It includes three operation modes described below.

[DSK SWP]	sweeps the sweeping items linearly.
[DSK 1LG SRCH]	sweeps keeping the 1LG setting of the amplitude value and phase value.
[DSK 2LS SRCH]	sweeps keeping the 2LS setting of the amplitude value and phase value.

Set the fault values to 1LG setting for [1LG SRCH] and [DSK 1LG SRCH] , and to 2LS setting for [2LS SRCH] and [DSK 2LS SRCH]. ☞"3.4.2 0 1LG setting", "3.4.2 B) 2LS setting"

The operation modes above are operated by each parameter of the search/DSK search sweep menu in the other function.

- How to set Search/DSK-search sweep menu

  When the operation mode is set for Search/ DSK-search-sweep by ⑫ MODE key and MODIFY key, the Search/DSK-search-sweep menu is displayed on the ⑪【SETTING / DATA】.
  Alternatively, press SHIFT+OTHER FUC and MODIFY to select [SEARCH MENU].

  SETTING/DATA
  SEARCH M
  ENU
  SETTING/DATA

  Move the cursor down with ▼ and turn MODIFY to select the sweep times [SWP TIMES].
  Press ▶ and use the numeral buttons and MODIFY to select the sweep times (1-10).

  SETTING/DATA
  SWP TIMES
  ◀ 3
  SETTING/DATA

  Press ◀ to return to the [SEARCH MENU] of the other function.
  Rotate MODIFY to select the judge time [JUDGE TIME].
  Press ▶ and use the numeral buttons and MODIFY to select the judge time. (0.1-10.0s)

  SETTING/DATA
  JUDGE TIM
  E
  SETTING/DATA

  Set the trip-wait-time [TRP WAIT] following the same procedure.

  (0.1-10.0s)

  SETTING/DATA
  TRP WAIT
  ◀ 0.1s
  SETTING/DATA

  [OUTPUT CUT] "ON/OFF" setting is available.
  - on : Amplifier-output is turned off after measurement.
  - off : Amplifier-output is not turned off after measurement.

  SETTING/DATA
  OUTPUT C
  UT
  SETTING/DATA

Note: The trip-wait-time is a parameter available in the DSK search sweep only.

■ Recommended settings

The following setting would assure correct measurement depending on the type of the protective relay.

Normal value:	about 70/130 % of expected Operation/Recovery value
Fault value:	about 130/70 % of expected Operation/Recovery value
Sweep time:	5 sec.
Sweep times:	3
Judgment time:	0.1 sec.

A) Search sweep

When a sweep starts from the normal value to the fault value and Trip-input signal turns to ON-state, the sweep is suspended.

When the judge time has passed, the Trip-input signal ON/OFF-state is checked again, and the sweep will be resumed in the opposite direction if the Trip-input signal remains ON-state, and in the same direction if the Trip-input signal is OFF-state.

As the first ON-state of Trip-signal can be seem to be attributed to chattering if the Trip-signal is recovered to OFF-state during the judge time span, then the sweep will be resumed in the same direction.

Since the sweep time increases twofold at every resuming, that is, the sweep runs at slower rate, a more accurate measurement can be obtained in a shorter time.

The user can select either Operation-value or Recovery-value according to selecting SWEEP▼ / SWEEP▲ key for sweep start trigger.

SWEEP▼ : Operation-value detection

SWEEP▲ : Recovery-value detection

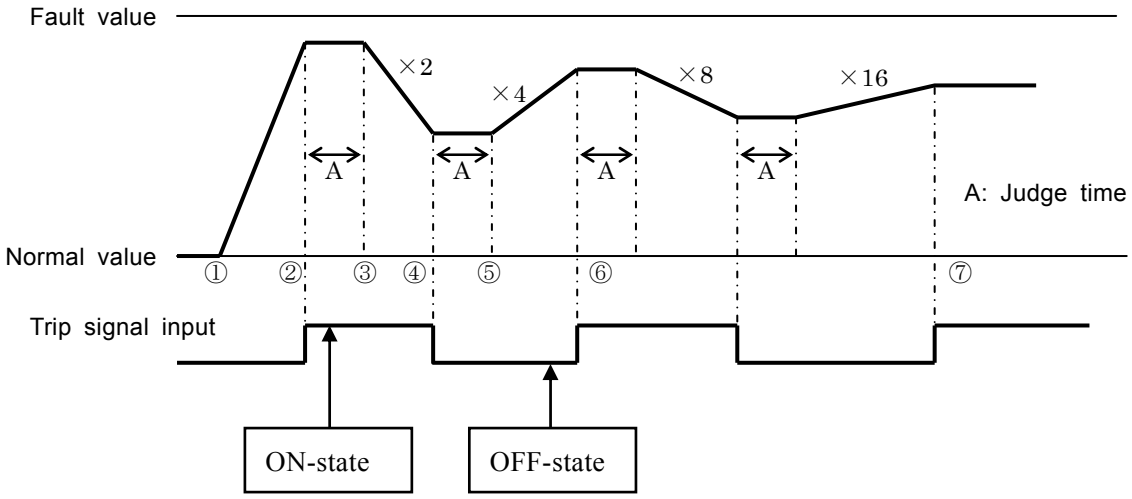


Figure 3-20 Operation of search sweep

①When SWEEP▼ is pressed, the sweep will start from the normal value to fault value in the set sweep time.

[OPRATE VAL] and [1 TIMES] are displayed on the 【SETTING / DATA】.

SETTING/DATA
OPRATE VAL
SETTING/DATA

②When a trip-signal operates(ON), the sweep is suspended.

③When the set judge time has passed, the sweep is resumed toward the normal value if the trip-signal remains ON-state, and toward the fault value again if the trip-signal returns to OFF-state.

The sweep time is two times the first time.

④At the next trip-signal change, the sweep will be suspended.

⑤When the judge time has passed, the sweep is run in the opposite direction if the trip-signal remains as in (4) above, and in the same direction if it is changed. The sweep time is two times the previous time (i.e., four times the first or the set time). The indication of the sweep run changes to [2 TIMES], then to [3 TIMES] and so on at every sweep from normal value to fault value.

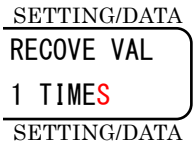
⑥The above steps are repeated while the sweep time doubled at each run.

⑦When the set times of fault-direction-sweep-run have been performed, the test is finished and the LED of the STOP lights up. Now the output is turned off if the output-cut is set for [on].

Since the test ends with the last sweep run in the fault direction in the above procedure, this is operation

value detection.

If the test is started with a press on the SWEEP▲, then the test ends after execution of set times of normal-direction sweep run, this is recovery value detection.
[RECOVE VAL] is displayed on the 【SETTING / DATA】.
If the system fails to detect any operation or recovery value, [ERR] will be shown to finish the measurement.



B) DSK search sweep

Disk type protective relays have longer operation-time, which makes it takes much time to measure Operation /Recovery-value. Therefore, the test begins with a Quick-change to the fault-state value, then, after confirming Trip-input operation (On-state), a sweep starts from fault value to normal value.

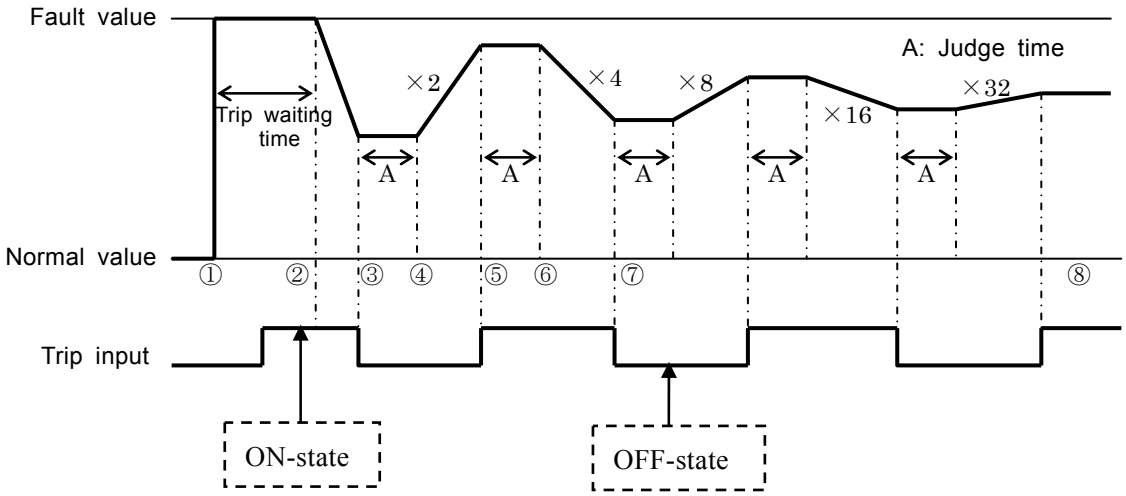


Figure 3-21 Operation of DSK search sweep

① Press the SWEEP▼, and a quick-change to the fault value occurs.

Indication of [OPRATE VAL] and [1 TIMES] are shown.

SETTING/DATA
OPRATE VAL
1 TIMES
SETTING/DATA

② When the set judge-time has passed, and if the trip-input signal is keeping ON-state, the sweep is started from the fault value to the normal value in the set sweep rate.

③ When the trip-input signal returns to OFF-state, the sweep is suspended.

④ When the set judge-time has passed, the sweep is resumed toward the fault value if the trip-input signal remains OFF-state, and toward the normal value if the trip-input signal is ON-state.

The sweep time becomes two times the first time.

⑤ At the next trip signal change, the sweep is suspended.

⑥ When the judge-time has passed, the sweep is run in the opposite direction if the trip-input remains as in the previous run, and in the same direction if it is changed. The sweep time is two times the previous time (i.e., four times the first or the set time). Every time the sweep is run in the fault direction, the Sweep-times displayed increases such as [2 TIMES] and [3 TIMES].

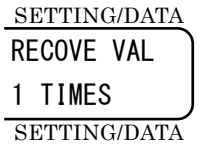
⑦ The above steps are repeated while the sweep time is doubled at each run.

⑧ When the set Sweep-times of fault-direction-sweep-run have been performed, the test is finished and the LED of the STOP lights up.

Now the Amplifier-output is turned off if the output-cut is set for [on].
Since the procedure ends with the last sweep run in the fault direction in the above procedure,

this is Operation-value detection.

If the test is started with pressing SWEEP▲ key, then the test comes to an end after execution of set Sweep-times of normal-direction-sweep-run.
This is recovery value detection.



[RECOVE VAL] is displayed on the 【SETTING / DATA】.
If the system fails to detect any Operation/Recovery-value, [ERR] will be shown and the measurement will be finished.

3.5.7 Operation of 95 relay test mode (frequency relay)

In the Frequency-relay (95 relay) test mode, the following four data can be obtained by single operation.
trip-operation frequency, recovery frequency, operation time and recovery time.

An operation start command is given by FAULT, SWEEP▼ ㊹ key or an Operation-start-input⑤⑥.

An operation stop command is given by NORMAL and STOP ㊹ key.

When the frequency relay test mode is set, the frequency setting is automatically set for [INTERNAL].

In frequency relay test mode, several parameters must be set in the frequency relay test menu.

- Setting procedure of the frequency relay test menu

  When frequency relay test mode is selected for the operation mode, the frequency relay test menu is displayed on the【SETTING / DATA】. [FREQ RELAY] can be also selected by pressing SHIFT+OTHER FUNC and rotating MODIFY.

  Move the cursor down with ▼ and rotate MODIFY to select the cross frequency [CROSS FREQ].
  Press ▶ and use the numeral buttons or MODIFY to set the cross frequency. (10.000～200.000Hz)
  Press ◀ to return to [FREQ RELAY].
  Rotate MODIFY to select the sweep rate [SWEEP RATE].
  Press ▶ and set the sweep rate with the numeral buttons or MODIFY. (0.001-9.999Hz/s)

  The hold time is set by the same procedure. (0.01-650.0s)

  [on] / [off] of the Amplitude-Quick-Change is also set by the same procedure.

SETTING/DATA
FREQ RELAY
CROSS FREQ ▸
SETTING/DATA

SETTING/DATA
CROSS FREQ
◂ 48.500
SETTING/DATA

SETTING/DATA
SWEEP RATE
◂1.000 H/s
SETTING/DATA

SETTING/DATA
HOLD TIME
◂ 0.01 s
SETTING/DATA

SETTING/DATA
AMP QC
◂on
SETTING/DATA

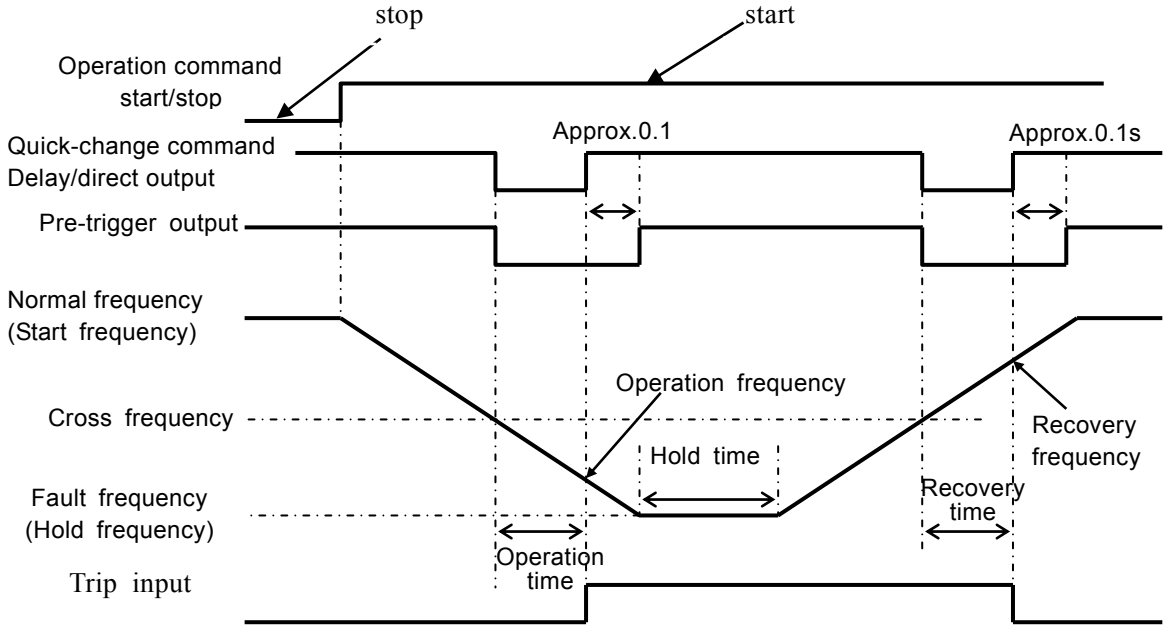


Figure 3-22 Operation of frequency relay test mode

■ Amplitude quick change

In the frequency relay test mode, the output amplitude can be quickly changed just before the frequency starts to sweep.

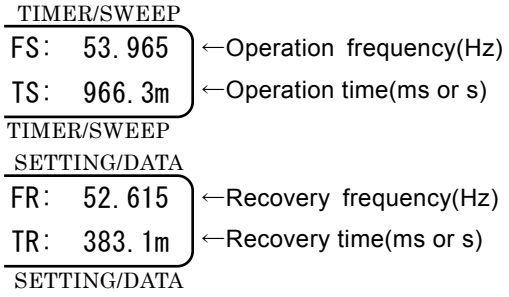
If the amplitude quick change setting in the frequency relay test menu is turned [on], the amplitude fault value setting is available. The frequency sweep starts just after the amplitude output is quickly changed to the fault value.

When the frequency sweep is over, the amplitude output returns to the normal value.

When the amplitude quick change setting is [off], the amplitude fault value setting is not available.

■ Display of measurement data

The measurement results are displayed on the【TIMER/SWEEP】,【TIMER MODE/SWEEP TIME】and【SETTING / DATA】.



When the measurement fails, the result is displayed as [----------].

3.5.8 Operation of SOR quick change mode (Step-out Relay)

SOR quick mode is a mode to check the operation of a Step-out Relay.

An operation start command is given by FAULT or operation start input.
An operation stop command is given by NORMAL and FAULT.

SOR quick change mode allows to shift four preset status, STEP1 (normal value), STEP 2, STEP 3 and STEP 4 (fault value) in a preset dwell time.

Dwell time of STEP 1 T1 (0.010-9.999s, resolution of 1ms)
Dwell time of STEP 2 T2 (0 and 0.010-9.999s, resolution of 1ms)
Dwell time of STEP 3 T3 (0 and 0.010-9.999s, resolution of 1ms)
Dwell time of STEP 4 T4 (0 and 0.010-9.999s, resolution of 1ms)

Press SHIFT+DISPLAY SW to set STEP 2 and STEP 3 and T1 through T4.

MODE	NORMAL V1(V)	NORMAL V2(V)	NORMAL V3(V)	TIMER/SWEEP
SOR	0.00	0.00	0.00	T1:0.010s
STEP2	0.0	0.0	0.0	T2:0.000s

NORMAL FREQ(Hz)	NORMAL φ1(°)	NORMAL φ2(°)	NORMAL φ3(°)	TIMER/SWEEP TIME

MASTER/SLAVE	FAULT V1(V)	FAULT V2(V)	FAULT V3(V)	SETTING/DATA
SOR	0.00	0.00	0.00	T3:0.000s
STEP3	0.0	0.0	0.0	T4:0.000s

FAULT FREQ(Hz)	FAULT φ1(°)	FAULT φ2(°)	FAULT φ3(°)	SETTING/DATA

The normal side is STEP 2 and the fault side is STEP 4. Move the cursor with ▲, ▼, ◄ and ► , and set with the numeral buttons and MODIFY. The previous display will be brought back by pressing SHIFT+DISPLAY SW again.

When the operation starts, the output shifts by the preset dwell time of each step in order of STEP 1, STEP 2, STEP 3 and STEP 4.

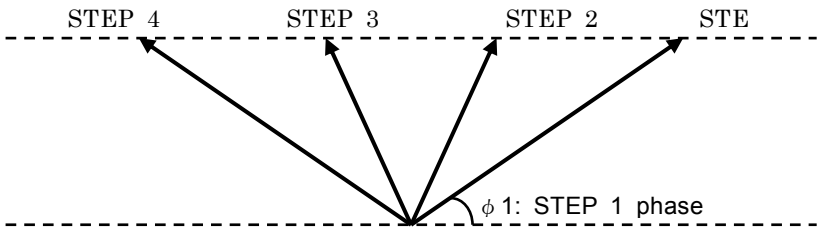


Figure 3-23 Setting example of each step in SOR test mode (vector diagram)

When the dwell time of STEP 4 has passed, the output returns to STEP 1.
If some change occurs in trip input during the shift, [TRIP CHANGE] is displayed on the【SETTING / DATA】, and if no change occurs, [NO TRIP CHANGE] is displayed.

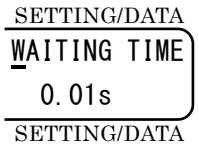
When T2, T3 or T4 is set to " 0 ", the output can be stopped (fixed) with the step setting. To return to STEP 1 at this time, press NORMAL (operation stop command).

3.6 Other basic operation

Other function, panel setting memory function and control power output operation are described here.

3.6.1 Other function

Other functions include rarely used function and function which operation mistake needs to be avoided.
To set the other function, press SHIFT+OTHER FUNC
to display the other function which the user wish to use on the【SETTING / DATA】using MODIFY.



The following is a list of other functions.

Fault waiting time	[OP:RECOV]	☞"3.5.4 Simultaneous operation/recovery measurement mode"
Freq test relay	[FREQ RELAY]	☞"3.5.7 Operation of 95 relay test mode (frequency relay)"
Pre-trigger time	[PRETRIG TIME]	☞"3.5.3.C) Pre-trigger time and fault start phase"
Fault start phase	[START PHASE]	☞"3.5.3.C) Pre-trigger time and fault start phase"
Line calculation	[LINE CALCULATION]	☞"3.4.2 C) Line voltage calculation function"
Amplifier input selection	[INPUT SEL]	☞"4.2 Amplifier input signal selection"
Chattering correct	[CHATTERING]	☞"3.5.1.B) Setting of trip input chattering correction function"
Waveform selection	[WAVE SELECT]	☞"3.4.3 Waveform selection"
Harmonic 1	[HARMONIC 1]	☞"3.4.3.A)

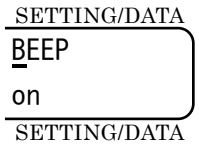
Setting of harmonic-1 parameters“

Phase setting	[PHASE MODE]	☞“3.4.2 Setting of amplitude and phase“
Search･DSK menu	[SEARCH MENU]	☞“3.5.6 Operation of Search / DSK-Search sweep“
Timer setting	[TIMER MENU]	☞“3.5.3.A) Timer“
Stop setting	[STOP FUNC]	☞“3.5.1.D) Stop Function of operation start input “
Start input	[START INPUT]	☞“3.5.1.C) Setting of operation start input logic“
Phase rotation	[Rotate Phase]	☞“3.4.2 D) Phase rotation“
Trip phase select	[TRIP PHASE]	☞“4.1.3 E) Trip phase selection function“
Switch control	[SW CTRL]	☞“4.1.3.D) Selector communication function“
PSW mode	[PSW MODE]	☞“3.5 Operation mode“
Beep setting	[BEEP]	☞“3.6.1. A) Beep setting“
GPIB setting	[GPIB]	☞“5.2.3 Setting of GPIB“
RS-232C setting	[RS-232C]	☞“6.2.4 Setting of RS-232C“

A) Beep setting

This function turns on and off the beep sound when buttons are pressed and when error occurs. Note that the beep does not sound at overload when it is turned off.

Press SHIFT+OTHER FUNC to display the other function on the【SETTING / DATA】.
Rotate MODIFY and select [BEEP].
Move the cursor down with ▼ and turn MODIFY to select [on] or [off].



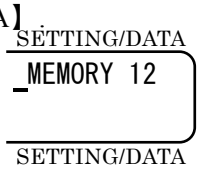
3.6.2 Panel setting memory

This function allows writing and reading of the memory number from 0 to 31 on the panel. The setting parameters for writing and reading is the same as "Table 3-1 List of Initial Values of Panel Setting ".
(Memory No. 32 is a default value for 50Hz and No. 33 is a default value for 60Hz and read only.)
Once test conditions have been set and written into the memory, they can be retrieved on the next test occasion, the user does not need setting them again.
In addition, the user can add comment when writing. Comment can be written within ten characters including numbers, [–] and [·]. (Also alphabets can be used in GPIB and RS-232C.)

The written memory data of No 1 to 31 can be cleared.

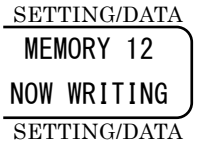
Memory write, read and comment input

Press MEMORY NO ㊸to display the panel setting memory on the【SETTING / DATA】.
Rotate MODIFY to select the memory to be operated from [MEMORY 0] to [MEMORY 31].



- Write

  Press SHIFT+WRITE ㊸to write in the selected memory.
  [NOW WRITING] is displayed during writing.



- Memory reading

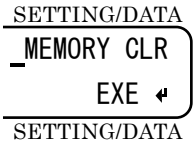
  Press SHIFT+READ ㊸to read the selected memory. [NOW READING] is displayed during reading.
  When memory reading is executed, the output turns off in all outputs for safety.

- Comment input

  Move the cursor down with ▼ and input the comment with numeral buttons, then set with ENTER.

■ All memory clear

Press MEMORY No ㊸to display the panel setting memory on the【SETTING / DATA
Rotate MODIFY to select [MEMORY CLR] and move the cursor down with ▼,
then, clear the memory with ENTER key.



4. Practical operation

4.1 Master/slave function of this series

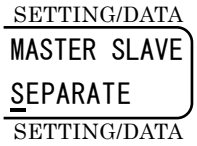
Units in this series allow to be combined into a multi-phase system by connecting them one to others with a supplied daisy-chain control signal cable to make a master/slave configuration.
In a master/slave configuration, performance will be as follows:

- The frequency of all slave devices that are connected will be synchronized with that of the master device, and the phase of the master device will be the standard phase. Frequency can not be set from a slave device.
- Phase setting in any of master device or slave devices can be used in the same way as the use in a single unit.
- Operation in the master device causes a simultaneous quick change in all devices connected in the master/slave system. The timing of quick change is dominated by the master device.

4.1.1 Master/slave setting

Master/slave configuration includes [SEPARATE], [MASTER] and [SLAVE].
The setting item is displayed on the【SETTING / DATA】.
When the master/slave setting is changed, the output is turned off in all outputs for safety.

- Setting procedure
  Press MASTER/SLAVE ⑫to display【MASTER / SLAVE / SEPARATE】 on the【SETTING / DATA】.
  Select the setting with MODIFY and press ENTER.



■ [SEPARATE]

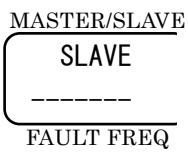
RX4718W operates separately. Use this setting when RX4718W is used as a single unit.
When RX4718W is used as a single unit, remove the daisy-chain master/slave control signal cable.

■ [MASTER]

This makes RX4718W a master device. The other devices connected to master devoice with ~~a~~ daisy-chain master/slave control signal cable (excluding 4741) will be destined for slaves (max. 3 devices).

■ [SLAVE]

This makes RX4718W a slave device. When the other device connected to slave devices with a daisy-chain master/slave control signal cable becomes a master device, this device will be destined for a slave.
【NORMAL･FAULT FREQ】on the slave device displays [-------].



4.1.2 Master/slave connection

- Turn off the power of all devices, and pile up devices (max. 4).
- Connect the supplied power cable to the power input of the bottom device.
- Use supplied daisy-chain power cables and connect the device to the upper device in turn.

☞ "2.3 Grounding and power supply"

RX4718W has 15A of a maximum usable current capacity.

Avoid exceeding this value in use

- Connect a supplied daisy-chain control signal cable across the connectors of the parallel control signal in order. (These connectors and the cable do not distinguish between input and output.)
- Trip and operation start signals must be connected to the master device.

Do not connect them to any slave devices.

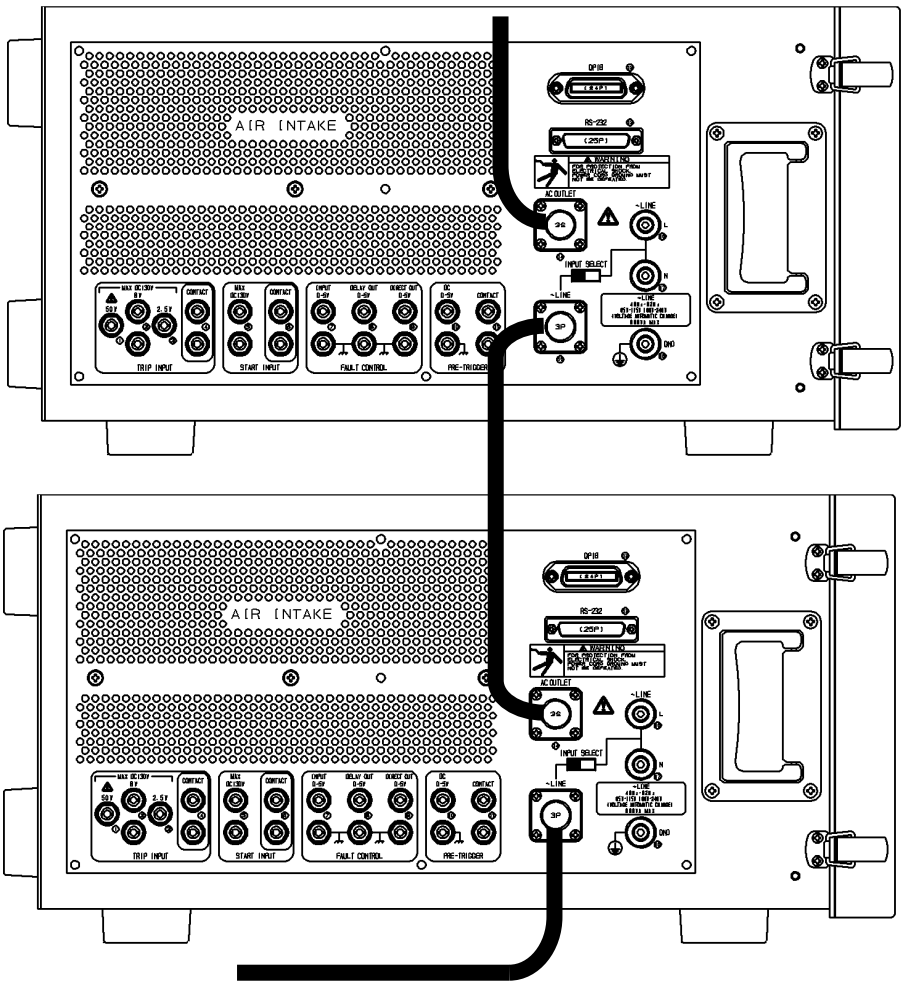


Figure 4-1 Master/slave power connection

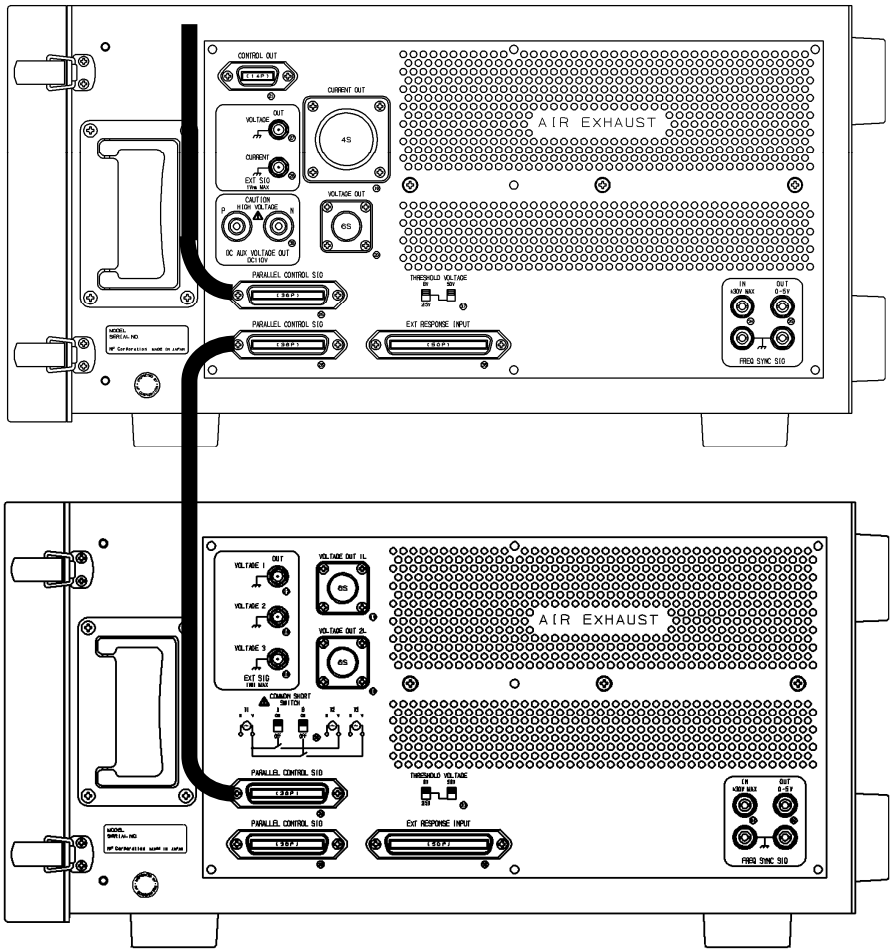


Figure 4-2 Connection of a daisy-chain master/slave control signal cable

4.1.3 Master/slave operation

A) Synchronization of operation mode

When the operation mode of a master device is changed, the operation mode of a slave device will automatically change to the same mode as the master device.

The slave device will operate according to the operation command of the master device.

When the operation mode is different between the master device and the slave device, they do not operate properly.

When the operation mode of the master device does not exist in the slave device, an error occurs. In this series, the following operation modes exist in the RX4718W only.

[1LG SWEEP], [2LS SWEEP], [1LG SRCH], [2LS SRCH], [DSK 1LG SRCH], [DSK 2LS SRCH]

In the sweep operation mode, the parameters of the slave devices must be set to the same parameters of the master device.

When the settings are different between master device and slave devices, the operation does not work well.

Normal sweep	[SWEEP], [1LG SWEEP], [2LS SWEEP]
Search sweep	[SRCH SWEEP], [1LG SRCH], [2LS SRCH],
DSK search sweep	[DSK SWEEP], [DSK 1LG SRCH], [DSK 2LS SRCH]
Frequency relay test mode	[FREQ RLY]

B) Simultaneous setting change

If a master device changes amplitude and phase value with MODIFY dial when the cursor of a slave device is on the setting position for amplitude and phase, the value where the cursor is on the setting position of the slave device changes simultaneously. (Three phases at once is available too.)

In order to disable this function, press CURSOR ON/OFF of the slave device. The cursor of the slave device is disappeared. (LED of CURSOR ON/OFF lights on.)

Press CURSOR ON/OFF again, and the cursor of the slave device will appear to enable the function. (LED of CURSOR ON/OFF lights off.)

C) All outputs on/off

If ALL OUTPUT key of a master device is pressed, all outputs of slave devices also turn on/off.

However, since all-outputs-on function can be risky, the internal dip switch can disable all-outputs-on function of the slave device.

☞"2.2 Setting of internal dip switch"

All-outputs on /off command can be received by 4717W, 4718W and 4723 only.

D) Selector communication function

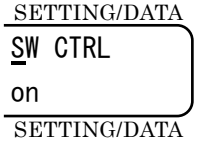
This function allows turning ON and OFF the synchronization of R, S, and T between the devices of this series equipped with an output selector for master/slave operation.

- Setting procedure

  Press SHIFT+OTHER FUNC to display the other function on the【SETTING / DATA】.

  Rotate MODIFY and select [SW CTRL].

  Move the cursor down with ▼ and turn MODIFY to select [ON] or [OFF].



E) Trip phase selection function

This function is available when this series 4741 is the following version.

Japanese version 1.32, 1.34, 1.42

English version 1.33, 1.35, 1.43

When 4741 is a master device, and test mode is total test mode or line PD, output amplitude of RX4718W will be set to " 0V " (trip status) during the " OFF state " of trip-signal according to output-channel setting.

- Setting procedure

  Press SHIFT+OTHER FUNC to display the other function on the 【SETTING / DATA】.

  Rotate MODIFY and select [TRIP PHASE].

  Move the cursor down with ▼ and turn MODIFY select a trip phase, and press ENTER.

SETTING/DATA
TRIP PHASE
3PHASE
SETTING/DATA

[3 PHASE]	All phases are tripped.
[R]	V1 only is tripped.
[S]	V2 only is tripped.
[T]	V3 only is tripped.
[R-S]	V1 and V2 are tripped.
[S-T]	V2 and V3 are tripped.
[T-R]	V3 and V1 are tripped.

The following figure shows the performance of RX4718W when the trip phase is set as [R-S].

Setting of 4741 [MASTER], [TOTAL TEST], [RETRIP], [3 PHASE SIMUL]

Setting of 4718 [SLAVE], [R-S]

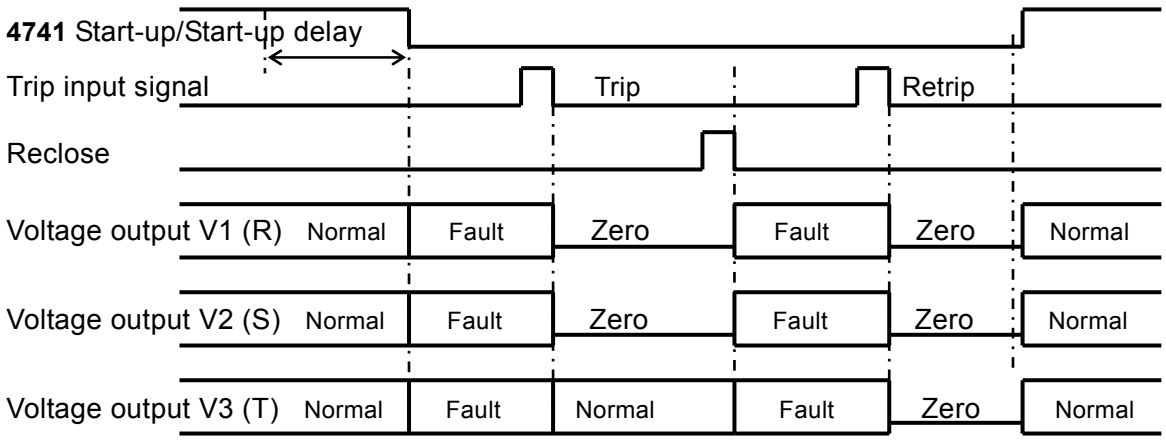


Figure 4-3 Performance of trip phase selection function

4.2 Amplifier input signal selection

The internal synthesizer signal set in “3.4.1 Frequency setting“ through “3.4.3 Waveform selection“ is output to the external signal output㉗㉘ with a range full-scale of 1 Vrms. This output is used to monitor the internal synthesizer signals and as a signal source of an external booster. The external signal output can be set whether to set the amplitude for 0 when the amplifier output is turned off. This setting can be done by an internal dip switch.

☞“2.2 Setting of internal dip switch“

■ Internal [INTERNAL]

The amplifier input signal is set to the internal synthesizer signal. This is a usual setting.

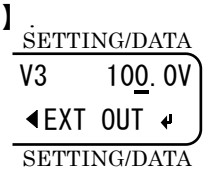
■ External output [EXT OUT]

The external signal output drives an external booster amplifier. All LEDs of the range keys of the output selected are turned off.

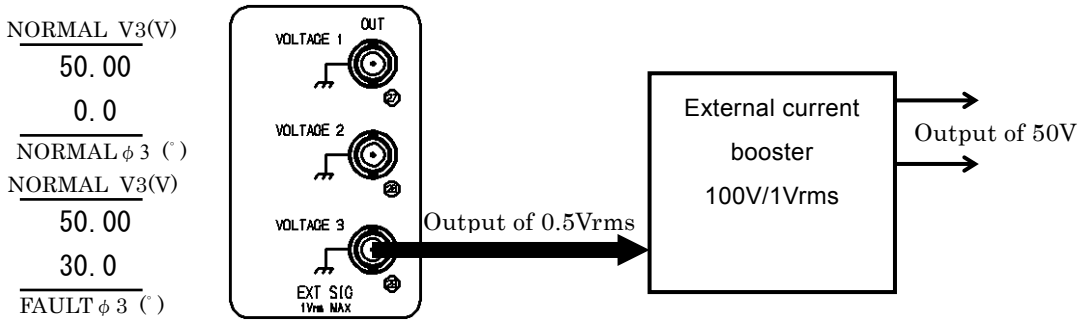
When the external signal output is 1 Vrms, the output amplitude of the external booster will be set as below.

Rotate MODIFY to select the external output [EXT OUT] and press ENTER,
then, the external booster amplitude is displayed on the 【SETTING / DATA】
Set the amplitude with the numeral buttons or MODIFY.

Setting range of voltage output 0.0-999.99V



When the external booster amplitude is [100.0V] and 【NORMAL・FAULT VOLTAGE】indicates [50.0V], the external signal output amplitude is 0.5Vrms.



Depending on OUTPUT-ON/OFF-SW of this amplifier, the output amplitude of the external signal output㉗㉘ is turns on/off according to the internal dip switch setting.

DIP-SW is not in 0-setting
error will occur.

<ON> LED stays off, and the amplifier output of the unit will not be output.

DIP-SW is in 0-setting

<ON> LED will be turned on and off, but the amplifier output of the unit will not be output.
The amplitude of external output ㉗,㉘ becomes and the external booster output also becomes " 0 V ".

☞"2.2 Setting of internal dip switch"

4.3 Operation of extended response input

The extended response input function can extend the trip input up to 255 channels by connecting an optional expansion box for response signal to the extended external response input.

- Setting procedure

  Press SHIFT+EXT RES INPUT to display the extended response input on the 【SETTING / DATA】.

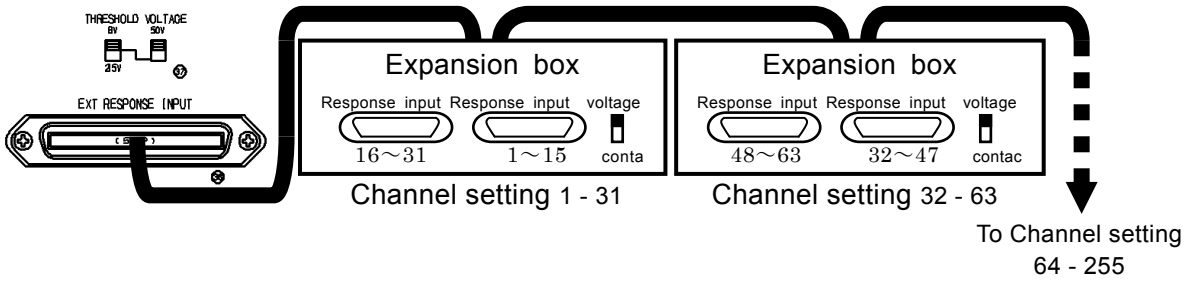
  Use the numeral buttons or MODIFY to set the channel of trip input. (0～255)

SETTING/DATA
EXT RESPNS
0
SETTING/DATA

" 0 " setting is for a trip input of RX4718W and " 1 through 255 " setting are for the response input of an expansion box for response signal.

⚠ Caution

Trip input of RX4718W always operates when signal input occurs regardless of the channel setting of the trip input.
When the optional expansion box for response signal is connected to the expanded external response input and the channel is set to the response input of the expansion box (1 to 255), connect nothing to the trip input of RX4718W.
If connection is made by mistake, it is dangerous because the trip input is connected in parallel to the response input of the expansion box inside of RX4718W.



The response input of an expansion box for response signal selects the voltage input and the contact input with a toggle switch of the expansion box.

When the voltage input is selected, the threshold voltage will be set as +2.5V, +8V and +50V by a slide switch of the judge voltage.

4.4 Operation in combined system with other type of units

RX4718W operates together with other type of units because of having operation of frequency synchronization and simultaneous quick change.
The frequency synchronization signal terminals and quick change signal terminal are on the right and left side panel.

4.4.1 Frequency Synchronization

When the frequency synchronization signal input/output is used, it will take about 1 second until the synchronization becomes stable.

Therefore, this disables the functions of frequency sweep and frequency quick change.

To synchronize the frequency of RX4718W with other systems, connect the synchronization signal of other system to the frequency synchronization signal input of RX4718W and select the external synchronization for the frequency mode of RX4718W. ☞"3.4.1 Frequency setting"

To synchronize the frequency of other systems with RX4718W, connect the frequency synchronization signal output of RX4718W to the frequency input of other system.

The frequency synchronization input/output signal of RX4718W contains two types: one for 4705A (a binding post terminal)

㉟ freq sync sig out (for 4705A) : Logic signal, falling edge is phase of " 0 ° "
㉞ freq sync sig in (for 4705A) : Logic signal, falling edge is phase of " 0 ° "
Threshold voltage of ㉞ High level: +2.5V
Low level: +1.5V

4.4.2 Synchronization of quick change operation

For synchronizing the quick change operation, select the quick change mode for the operation mode of RX4718W and use each quick change signal terminal.

☞"3.5 Operation mode ", "3.5.3 Operation of quick change mode"

Quick change signal terminals of RX4718W have two types: one for 4705A (a binding post terminal).

Signal output of RX4718W to synchronize the quick change operation of RX4718W with other system

- Quick change command direct output (for 4705A)

  This is a logic signal and turns to Low when RX4718W is in operation.

  In the quick change mode, when this signal changes to Low, the output of RX4718W quickly changes to fault after the pre-trigger time and the fault start phase.

  ☞"3.5.3. C) Pre-trigger time and fault start phase"

- Quick change command delay output (for 4705A)

  This is a logic signal which changes when the output of RX4718W quickly changes.

  It turns to Low when fault is output.

■ Signal input of RX4718W to synchronize the quick change operation of other system with RX4718W

- Operation start input (for 4705A)

  This is a signal input to start the quick change of RX4718W externally. The signal input includes a contact input and a voltage input. When this signal operates, the output of RX4718W quickly changes after the pre-trigger time and the fault start phase.

  Voltage input threshold voltage High level: +2.5V
  Low level: +1.0V

- Quick change command input (for 4705A)

  This is a logic signal and RX4718W outputs the fault when it is Low.

  Threshold voltage High level: +2.5V
  Low level: +1.0V

4.4.3 Connection with 4705A

A) Individual setting of pre-trigger time and fault start phase

The following connection allows setting the pre-trigger time and the fault start phase of RX4718W and 4705A individually and causing simultaneous quick change. RX4718W starts operation.

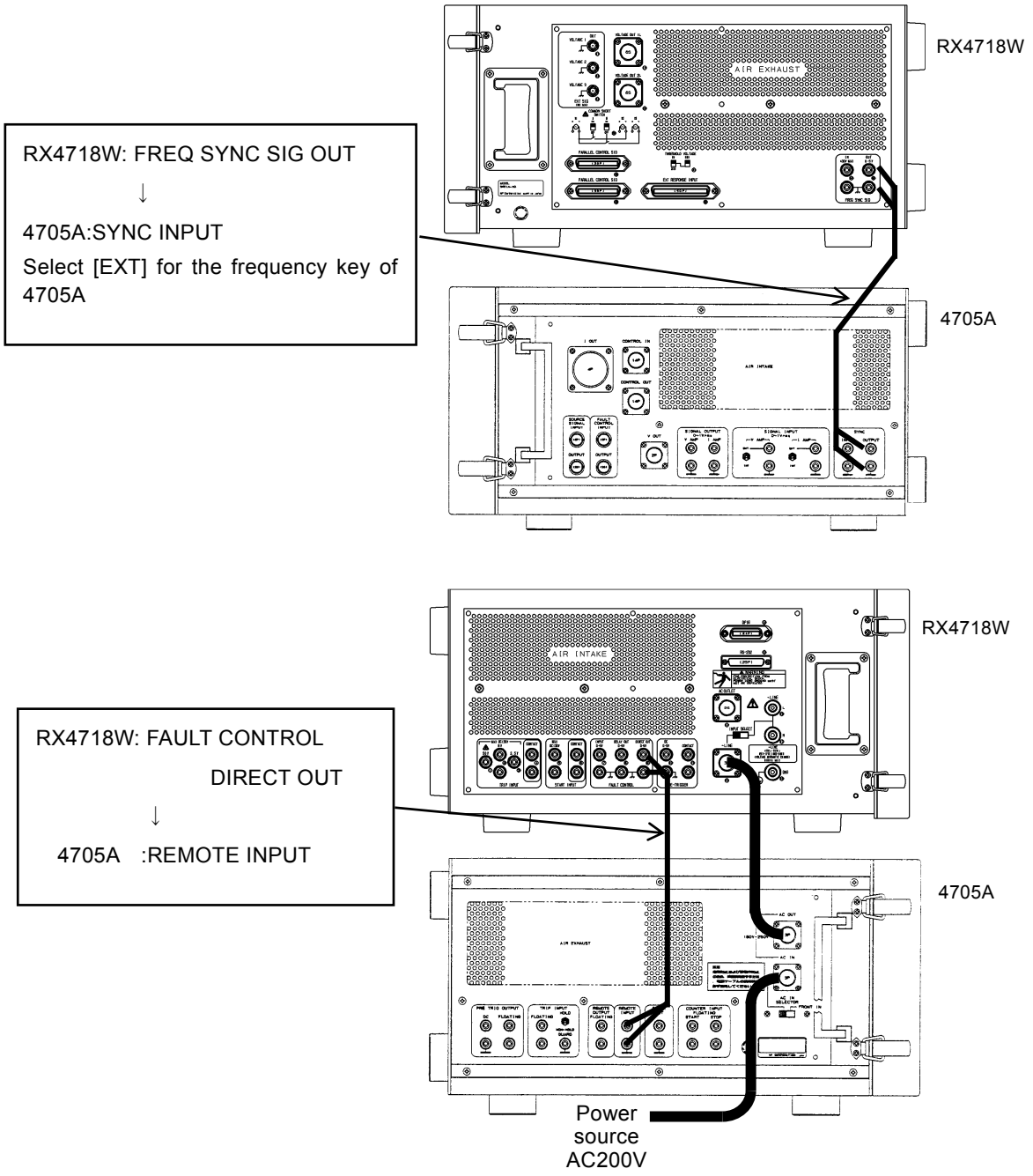


Figure 4-4 Connection diagram for individual pre-trigger time and fault start phase setting in 4705A

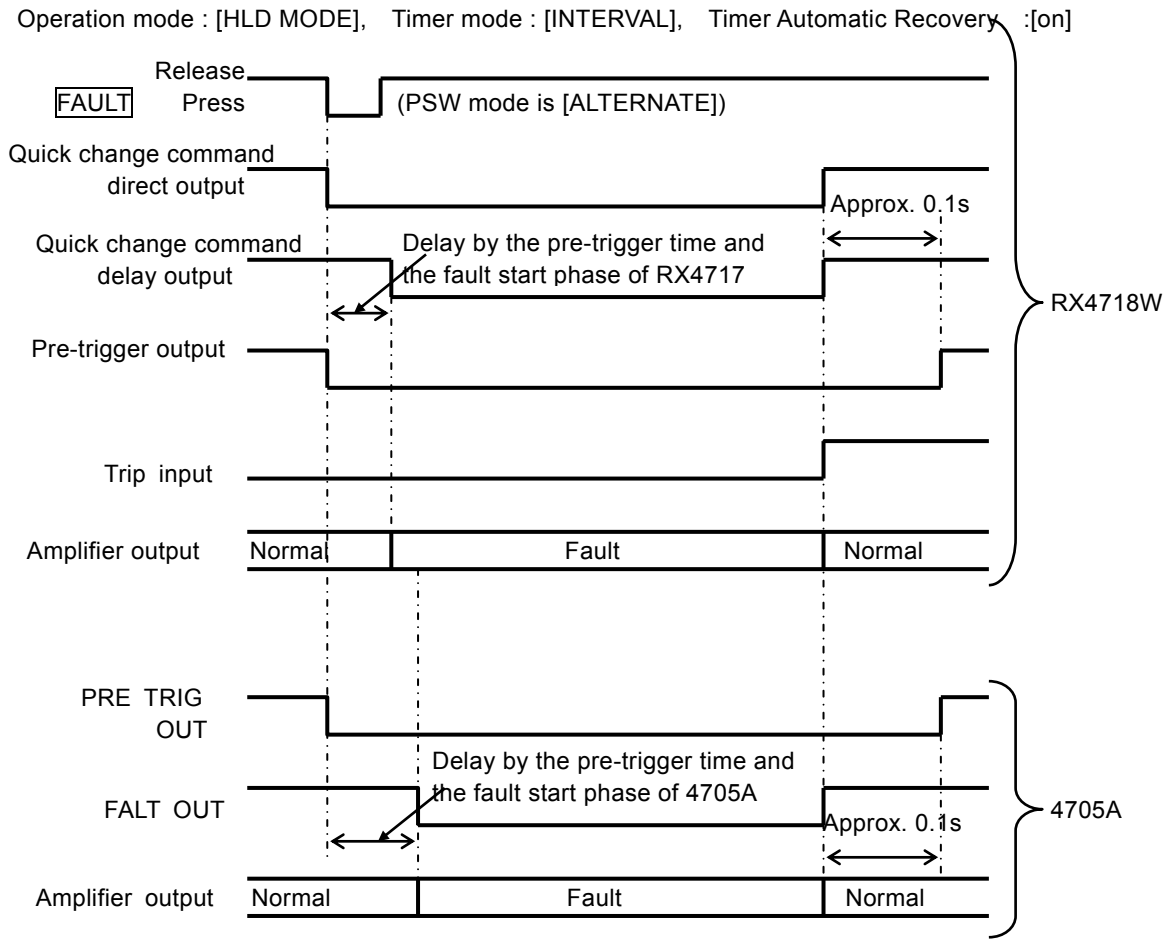


Figure 4-5 Operation when the pre-trigger time and the fault start phase are set individually in 4705A

B) Connection for simultaneous quick change to fault

To quickly change RX4718W and 4705A to fault simultaneously, make either of the following connections/settings.

- When the quick change command delay output of RX4718W is connected to REMOTE INPUT of 4705A, turn off the pre-trigger time and the fault start phase of 4705A.
- When the quick change control signal output or quick change command delay output of RX4718W is connected to FAULT CONTROL INPUT of 4705A, the pre-trigger time and the fault start phase of 4705A does not available.

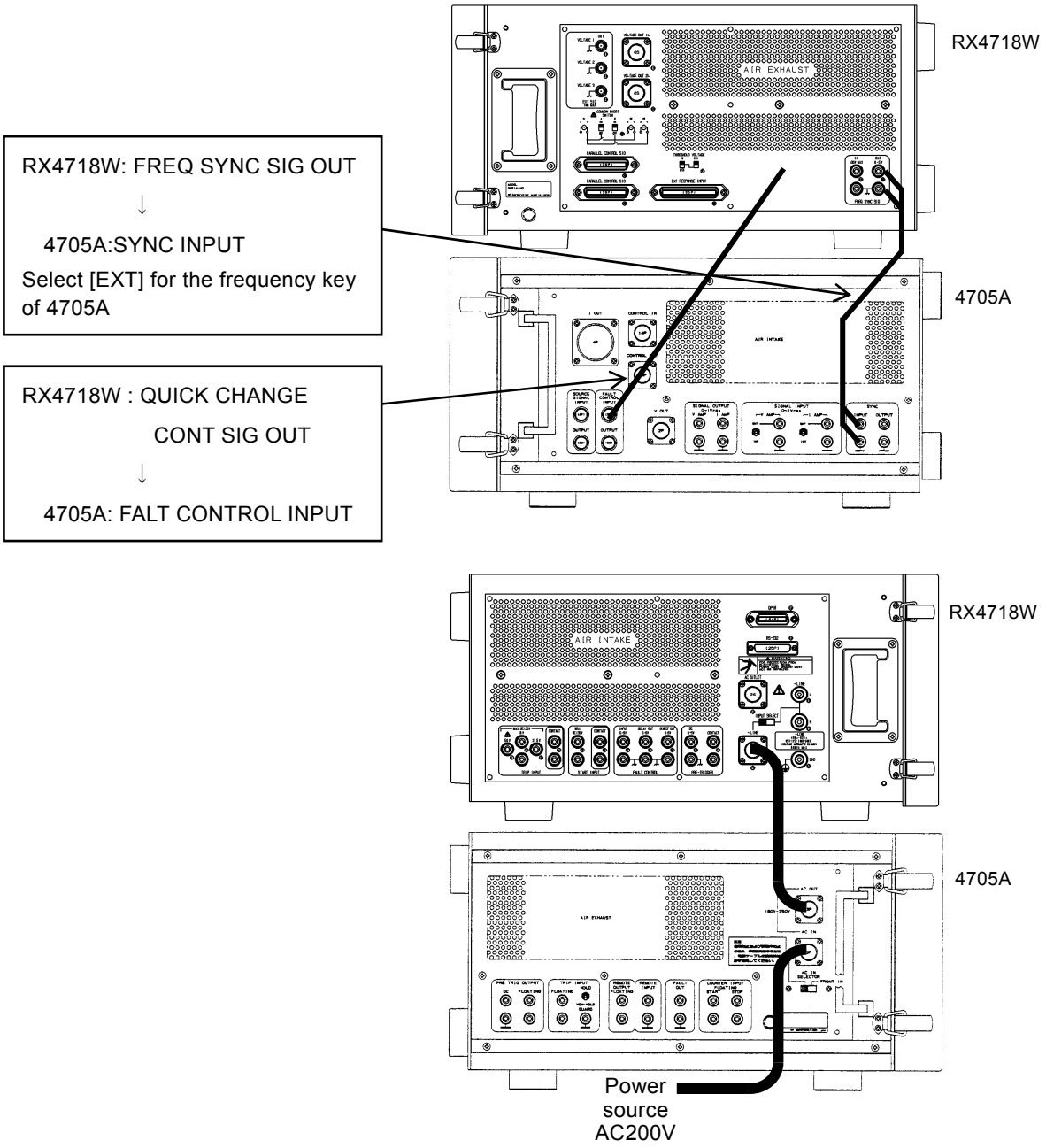


Figure 4-6 Connection diagram for simultaneous quick change with 4705A

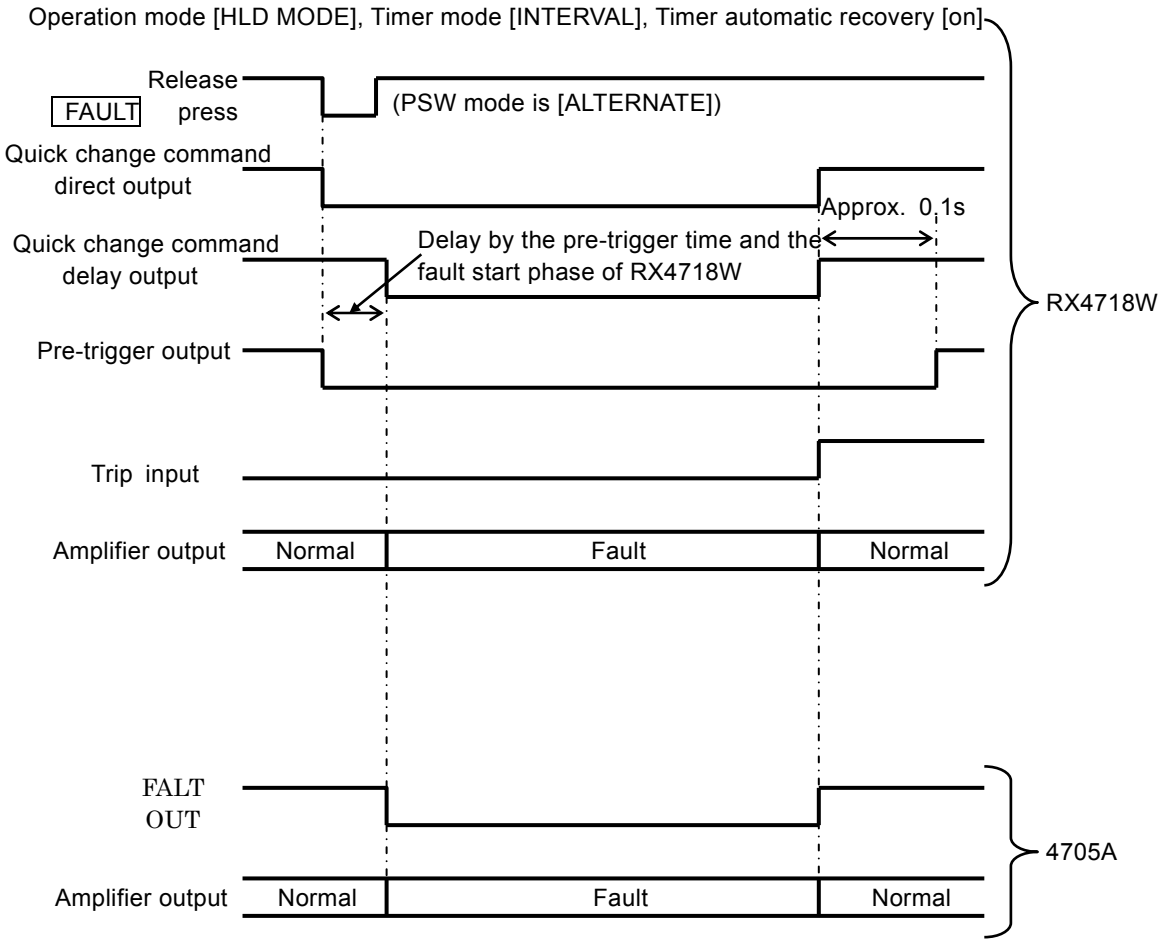


Figure 4-7 Operation for simultaneous quick change with 4705A

5. GPIB interface

5.1 Overview of GPIB

GPIB is a general-purpose interface bus system for digital devices. It was approved by Institute of Electrical and Electronics Engineers (IEEE) in 1975 and is used to standardize the remote controllers of the instrumentation and peripheral devices and data I/O transfer.

By embedding the interface that matches the GPIB standard in each controller and peripheral devices, the devices can be compatible through the interface connectors.

This interface bus can connect the maximum of 15 devices on a bus. Data can be transferred in accordance with the three-line handshake method, enabling the secure data transmission even if the sending side and the receiving side use different transfer speed devices.

GPIB has many names, such as IEEE-IB, IEEE-488 bus, HP-IB, standard interface bus, or byte serial bus. The official name of GIPB is "IEEE Std. 488-1978: IEEE Standard Digital Interface for Programmable Instrumentation".

GPIB bus and IEC bus are the same standard with the exception of the connector. Using the conversion connector can connect the two.

5.1.1 GPIB specifications

(1) Total cable length ····· 20m or less
(2) Cable length between devices ····· 4m or less
(3) Number of connectable devices (including controllers) ····· 15units or less
(4) Transfer method ····· Three-line handshake
(5) Transfer speed ····· 1M bytes/second (maximum)
(6) Data transfer ····· 8-bit parallel
(7) Signal lines
- Data bus ····· 8
- Control bus ····· 8
  Handshake bus (DAV, NRFD, NDAC)
  Control bus (ATN, REN, IFC, SRQ, EOI)
- Signal/system ground ····· 8

(8) Signal logic ····· Negative logic
- True : Low ····· 0.8V or less
- False : High ····· 2.0V or more

(9) Interface connector

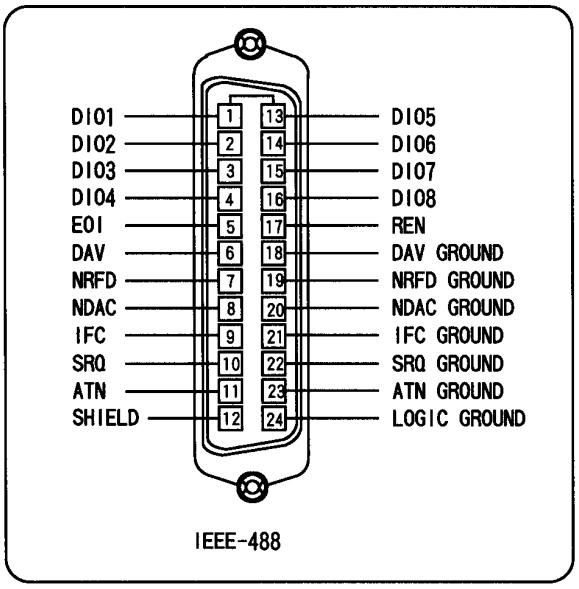


Figure 5-1 Interface connector

5.1.2 Signals on bus line and their behavior

GPIB bus line consists of 24 lines. They are eight data lines, eight control lines, and 8 signal/system ground lines

■ Data bus (DIO1 to DI08)

Data bus is I/O line that are used to input and output address and command information. They are distinguished by ATN lines. DI01 is used as LSB.

■ Handshake bus (DAV, NRFD, and NDAC)

The three line handshakes each other to perform secure data transmission.

- DAV(Data Valid)
  It indicates that the signal sent from a talker or controller to a DI0 line is effective.
- NRFD(Not ready for data)
  It indicates that the listener is ready to receive a signal from a DI0 line.
- NDAC(Not data accepted)
  It indicates that the listener has finished data reception.

■ Management bus (ATN, REN, IFC, SRQ, and EOI)

- ATN(Attention)

  It is a line sent from a controller that indicates which the signal sent from a DI0 carries data, address, or command.

- REN(Remote enable)

  It is a line sent from a controller that switches between remote control and local control.

- IFC(Interface clear)

  It is a line sent from a controller that initializes the interface of each device.

- SRQ(Service request)

  It is a management line that invokes a controller from a talker or listener. When the controller detects this signal, it starts performing serial polling or parallel polling.

- EOI(End or identify)

  It is used as an identification signal line for data end signal line or parallel polling sent from a talker.

5.1.3 GPIB handshake

This section explains GPIB handshake using data transfer as an example. The handshake is also performed when addresses or commands are transferred.

When GPIB handshake takes place, the state of every listener is checked. Until all listeners finish data transfer, talkers do not transfer new data, enabling secure data transfer even if the low speed device is used. The handshake behavior is decided by the state of the following signals:

NRFD ＝High　All listeners are ready for data reception.
DAV ＝Low　A talker transmits effective data on the data bus.
NDAC ＝High　All listeners finished data receptions.

The handshake timing chart is shown below.

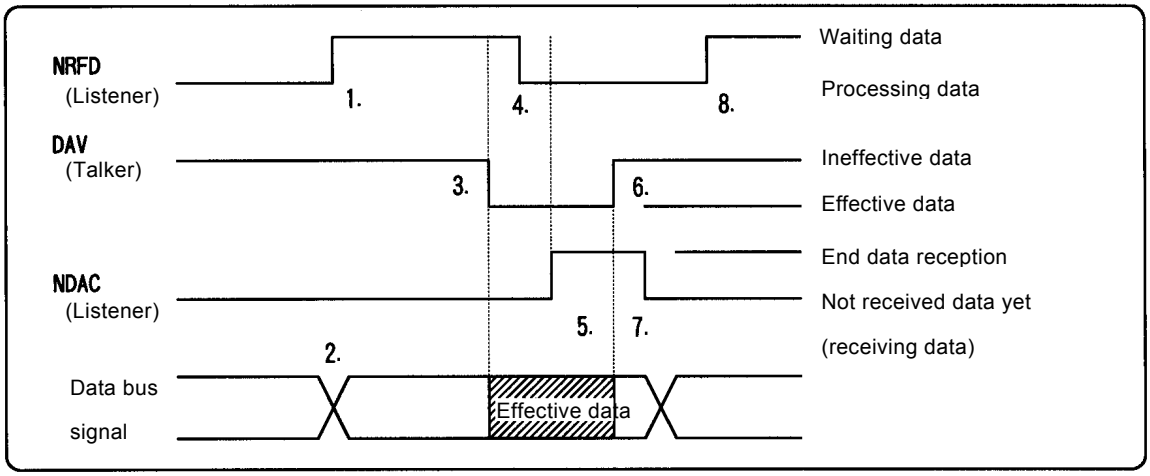


Figure 5-2 Handshake timing chart

1. All listeners are ready for data reception.
2. The talker outputs data to a data line. (This can be performed before step 1.)
3. The talker checks NRFD. If NRFD is set to High, the talker sets DAV to Low to notify the listener that the data is efficient.
4. When DAV is changed to Low, the listener starts reading data, sets NRFD to Low to notify the talker that data is being processed. When data input is finished, each listener set NDAC to High. NDAC on the bus is the OR of listeners' NDAC.
5. When all listeners finish data reception, NDAC is changed to High (the result of OR output) to indicate the talker of the end of the data reception.
6. The talker sets DAV to High to notify the listener that the data on the data bus is not effective.
7. The listener checks DAV is changed to High, set NDAC to Low, and finishes handshake with data reception uncompleted.
8. All the listeners finish data processing and indicate that they are ready for data reception.

5.1.4 Data transmission example

Shown below is an example of three-line handshake data transmission.
Data "ABC" is transmitted with delimiter "CR/LF".

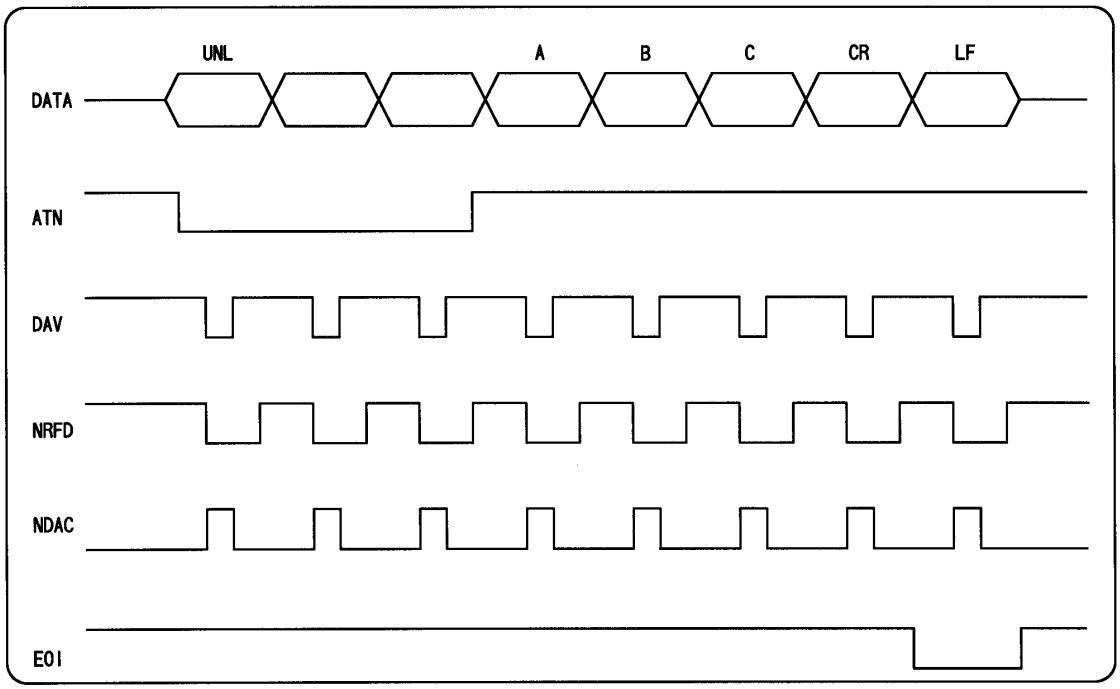


Figure 5-3 Data transmission example

5.1.5 Specifications of talker functions

- The number of talkers that can be used simultaneously on GPIB is one.
- When ATN signal of a controller is “H”, the talker transmits data to the listener.
- When data is being transmitted, handshake (source handshake) is performed automatically.
- The talker sends a service request (SRQ) to a controller.
- A talker can be used either in the local mode or the remote mode.
- Talker functions should be disabled under the following conditions:

  When the talker address of another device is received.
  When the talker is specified as a listener.
  When an untalk (UNT) is received.
  When IFC is received.

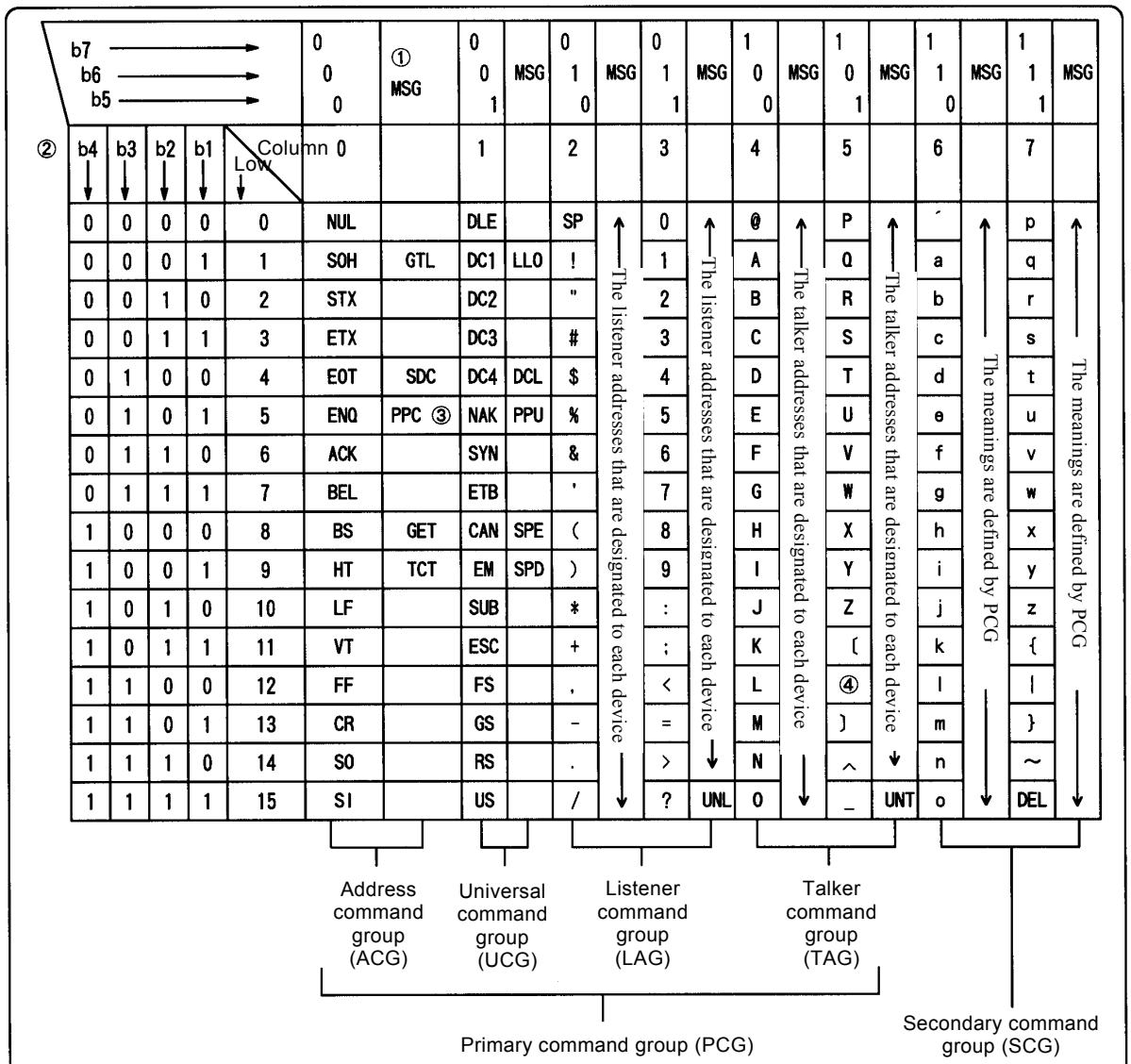
5.1.6 Specifications of listener functions

- Two or more listeners can be placed on GPIB.
- When ATN signal of a controller is High, the listener receives data from the talker.
- When data is being received, handshake (accept handshake) is performed.
- Listener functions should be disabled under the following conditions:

  When the listener is specified as a talker.
  When an unlisten (UNL) is received.
  When IFC is received.

5.1.7 Multi-line interface messages

The multi-line interface messages are output from the controller when the ATN signal is set to Low.
The list of the multi-line interface messages are shown in “Table 5-1 Multi-line interface messages.“



② b4	b3	b2	b1	Column 0	0 0 0	① MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
0	0	0	0	0	NUL		DLE		SP		0		@		P		`		p	
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	2	STX		DC2		"		2		B		R		b		r	
0	0	1	1	3	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	5	ENQ	PPC ③	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB		'		7		G		W		g		w	
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	10	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	11	VT		ESC		+		;		K		[		k		{	
1	1	0	0	12	FF		FS		,		<		L		④		l		|	
1	1	0	1	13	CR		GS		-		=		M		]		m		}	
1	1	1	0	14	SO		RS		.		>		N		^		n		~	
1	1	1	1	15	SI		US		/		?	UNL	O		_	UNT	o		DEL	

Notes :

(1) MSG is an interface message.
(2) b1=DI01 ..... b7=DI07, DI08 are not used.
(3) It carries the secondary command.
(4) Backlash (＼) is used in IEC standard and yen mark (¥) is used in JIS standard.

GTL.... Go to Local
SDC ... Selected Device Clear
PPC ... Parallel Poll Configure
GET ... Group Execute Trigger
TCT.... Take Control
LLO.... Local Lockout
DCL ... Device Clear
PPU ... Parallel Poll Unconfigure
SPE ... Serial Poll Enable
SPD ... Serial Poll Disable
UNL ... Unlisten
UNT ... Untalk

Table 5-1 Multi-line interface messages

5.2 RX4718W GPIB interface

For RX4718W GPIB interface, the parameters that can be set on the panel can also be set remotely. Because SETTING / DATA and setting status can be transferred to outer devices, you can construct sophisticated auto instrumental system easily.

The instructions that set RX4718W are called program codes. Each program code consists of three alphabets and numeral letters that follows ISO 8-bit code characters specifications.

ASCII character strings are used to output measurement data such as timer to the controller.

ISO 8-bit code character string or binary data can be used for arbitrary wave data. Using binar y data shorten the data transmission time.

Note that RX4718W GPIB interface and RS-232C can not be used simultaneously. In addition, the following settings can not be used with the GPIB interface.

Power on/off

GPIB setting (addresses, delimiters)

RS-232C setting (Baud rate, stop bit length, parity)

Operation of MODIFY

5.2.1 Specifications

■ Interface functions

Function	Subset	Explanation
Source handshake	SH1	All send handshake functions are available.
Acceptor handshake	AH1	All reception handshake functions are available.
Talker	T5	Basic talker function, serial poll, talk-only mode, talker disabler with MLA.
Listener	L4	Basic listener function, listener disabler with MTA.
Service request	SR1	All service request functions are available.
Remote/local	RL1	All remote/local functions are available.
Parallel poll	PP0	No parallel polling functions are available.
Device clear	DC1	All device clear functions are available.
Device trigger	DT0	No device trigger functions are available.
Controller	C0	No controller functions are available.

■ Bus driver function

DIO1-8 NDAC NRFD SRQ	Open collector
DAV EOI	3-state

■ Codes used

The program codes used for RX4718W setting are written in ISO 7-bit codes (ASCII). For the comments on panel setting memory, ISO 8-bit codes can be used.

Alphabetic characters are case-independence. Both uppercase and lowercase characters are translated and executed without any differences.

■ Address and delimiter ☞"5.2.3 Setting of GPIB"

The address and delimiter (for talker) of RX4718W is set on the other function and the set values are backed up with batteries while the power is turned off.

The range of address is a number between 1 and 30.

"CR" or "CR/LF" is selected and EOI signal is also sent with the delimiter at the same time.

The delimiter is one of "CR", "LF" and "EOI", or any combination of them for the listener.

■ Responses against interface messages

IFC	It initializes GPIB interface and releases the specified listener and talker.
DCL and SDC	It clears the I/O buffer for GPIB and error status, stops SRQ transmission, and resets SRQ factor. (The functions of the main unit do not change.)
LLO	It disables the GPIB LOCAL key on the panel.
GTL	It changes the status to Local.

■ Program codes

The program codes used for RX4718W setting are put in the input buffer at first. When a delimiter is received, the buffer is translated and executed at the sequence order.

The size of the input buffer is 1024 characters (1k bytes), and delimiters are not put into the input buffer.

If the input buffer receives more than 1k bytes of program codes, it overflows. The input buffer is cleared, and the program code is not executed.

If the program code contains a header or parameters that do not match the rule, the following data including the program code will be cleared and not be executed.

When the translation and execution finish, the input buffer is cleared and the next program code can be put into the buffer.

The program code is divided into a header and a parameter. If the size of the program code is less than the input buffer size, the next program code can be put into the buffer. Shown below is the syntax of the program code to be transmitted.

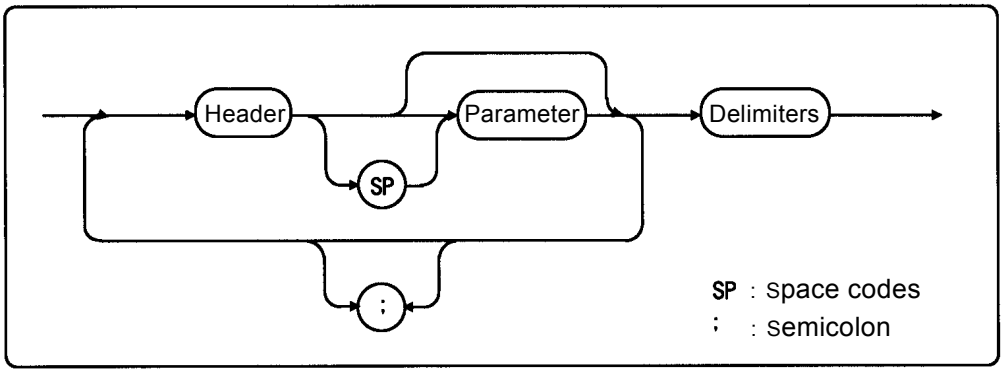


Figure 5-4 Syntax of program code

When you transmit multiple program codes continuously, you can place a space or a semicolon (;) between program codes for legible purpose. Because spaces and semicolons are also put into the buffer, using less spaces and semicolons enables efficient use of the buffer.

RX4718W program codes can be categorized into setting messages that set parameters or behavior and query messages that ask the status or setting.
The format of the basic setting message is shown below.

- Setting message (turning the fault start phase function on and setting it as 123.4°)

  FPC␣0;␣FPH␣123.4
  a b c d e a b c

- Query message (query on the fault start phase)

  ?FPH
  a

a: Header. It is case-independence.

b: Space. Any number of spaces can be placed for legible purpose. If you do not need a space, you do not have to put it.

c: Parameter. A parameter consists of polarity (+ or –) and a number. If the parameter size is bigger than the specified size, it is not set. If the parameter has a polarity but does not have it, the parameter is treated as it has plus polarity.

d: Semicolon. Any number of semicolons can be placed for legible purpose. If you do not need a semicolon, you do not have to put it.

Query messages correspond to setting messages with some exceptions. A question mark (?) is placed before the header of the setting message. A query message does not have a parameter. Only one query message can be sent per transmission. Once RX4718W receives a query message, the next time it is designated as a talker, the response data will be sent. If multiple query messages are sent continuously, only the last one is effective.
The program codes are listed in “Table 5-2 Program code list.“

■ Response message

FPH _ 123.4
a b c

a: Header. It consists of all uppercase characters. If the header is turned off (“HDR0”), it is not sent.

b: Space. If the header is turned off (“HDR0”), it is not sent.

c: Parameter. It is a value of floating-point parameter. Only minus (-) is specified for polarity.

■ Service request

A service request (SRQ) is a function that issues a interrupt to the controller when RX4718W is under the following conditions, and it sets SRQ signal line of the bus line to Low.

SRQ factors are as follows.

An error occurs.

Amplifier output is over.

Timer measurement is finished.

Sweep is finished.

When the controller detects SRQ from RX4718W and serial poll is performed, RX4718W transmits the following status byte to the controller and sets SRQ signal line back to High.

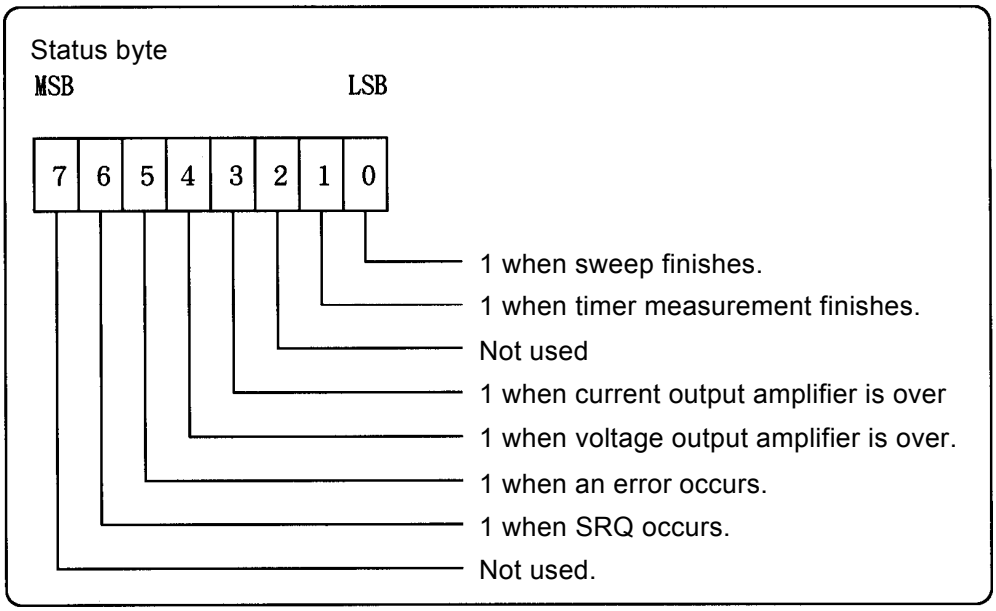


Figure 5-5 Status Byte

Service requests are selectable. To disable a service request, mask it by setting the bit for it to one. The header of the mask is [MSK] and decimal numbers should be used to set parameters.

If you want to use "Timer measurement finishes" and "Voltage output 1 amplifier is over", set 2^1 and 2^4 to 0 and set the other bits to 1. So the value of the bytes is "MSK 45 ($2^0+2^2+2^3+2^5 = 45$)".

Service requests are released under the following conditions:

After the status byte is issued with serial poll

Device clear (SDC or DCL) is received.

Mask takes place with "MSK" of the appropriate factor.

■ Error codes ☞"7.1Error message"

When an error occurs, issue query command "?ERR" and an error code is sent back.

5.2.2 Notes on handling GPIB

- The number of devices that can be connected to GPIB in the system is 15 including a controller. The cable length has the following limitations:
  - ・The total length of cables must be 2m multiplied by the number of devices or 20m, whichever the shorter.
  - ・The length of a cable must be 4m or less.
- Before detaching GPIB connector, turn RX4718W off. If other devices are connected to the bus, turn them off, too.
- When you use GPIB, turn all devices connected to the GPIB bus on.
- Attention should be paid to set GPIB addresses. If one talk address is assigned to multiple devices, they may be damaged.
- Attention should be paid to specify a delimiter. Inconsistent delimiter will cause a trouble.
- If the header of the program code sent to RX4718W has an error, the whole program code string will not be executed. If the parameter has an error, the program code will not be executed.
- If you specify RX4718W as a talker without an output request (without issuing a query message), the GPIB bus may be locked.
- Because the GPIB interface is assumed to be used in good conditions, avoid using it where the power swing is wide or lots of noises are generated.

5.2.3 Setting of GPIB

RX4718W has GPIB and RX-232C interfaces, but they cannot be used simultaneously. So when you use RX4718W, you must set GPIB or RS-232C interface.

Whether you use GPIB or not, parameters including addresses can be set on the other function. The values you wet will be backed up with batteries while the power is turned off.

If you want to use GPIB, set GPIB to on. When GPIB is set to on, RS-232C is automatically disabled. When GPIB is set to off, RS-232C is automatically enabled.

The address of GPIB is a number between 0 and 30. Usually address zero is assigned to the controller, so you may use a number between 1 and 30. The default value is 2.

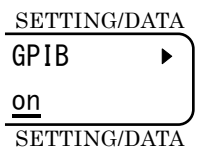
Delimiters are used when RX4718W transmits data. Choose “CR” or “CR/LF”. Any delimiters carry “EOI” with them.

- Setting procedure

  Press SHIFT+OTHER FUNC to display the other function on the【SETTING / DATA】.

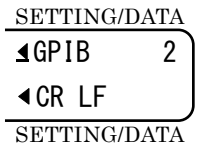
  Rotate MODIFY and select [GPIB].

  Move the cursor down with ▼ and turn MODIFY to select [on].



  Move the cursor up with ▲ and press ▶.

  Move the cursor with ▲ (up to address) and ▼ (down to delimiter) and set the address (0 to 30) and delimiter [CR] or [CR LF] with MODIFY.



5.2.4 Remote/local behavior

The remote/local status of GPIB shows whether peripheral devices are controlled by the controller or not.

If RX4718W is set to the remote status by the controller, LED of the GPIB LOCAL is lit off and RX4718W cannot be controlled on the front panel.

To return RX4718W to the local status, press the GPIB LOCAL. When RX4718W returns to the local status, GPIB LOCAL on the front panel is lit and RX4718W can be controlled on the front panel.

When you use the controller to set RX4718W to LLO (local lockout), GPIB LOCAL key is disabled, meaning that the controller controls the remote/local status of RX4718W. To exit from the local lockout, set uni-line message REN to High (False).

The behavior of remote/local is shown below.

Note that the talker does not have remote or local status.

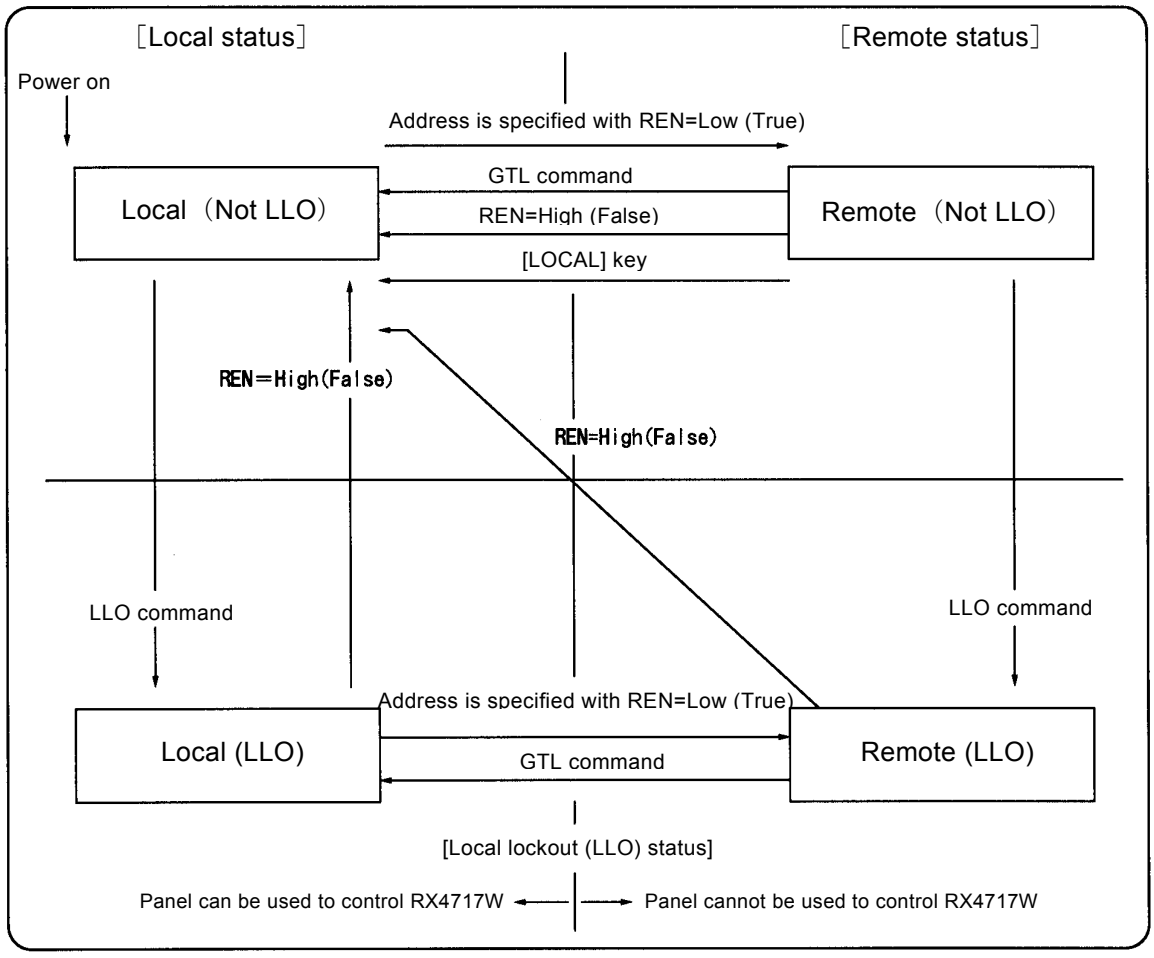


Figure 5-6 Remote/local behavior

5.2.5 Setting program codes

A) Setting the basic data on amplitude and phase

RX4718W has two types of amplitudes and phases. They are normal/fault and voltage output 1-3. You should specify the status and phase before setting amplitudes and phases.

For example, you should set below values to set the following status:

	Normal		Fault	
	Voltage output 1	Voltage output 3	Voltage output 1	Voltage output 3
Amplitude	63.5V	10V	32.8V	20V
Phase	0.0°	90.0°	30.0°	120.0°

- Transmission of program code

CES0 CEP0 RNG1 AMP63.5 PHS0 CEP1 RNG0 AMP1 PHS90 CES1 CEP0 AMP32.8 PHS30
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

OUC1 CEP1 AMP2 PHS120 OUC1 "CR/LF"
⑭ ⑮ ⑯ ⑰ ⑱ ⑲

Firstly, send CES0 (①) to transmit normal setting value, declaring the following data is normal setting values. Data from ② to ⑨ is treated as normal setting values.
Send CEP0 (②) to declare that the following data represents voltage output 1. Data items from ③ to ⑤ are interpreted as the setting value for voltage output 1.

RNG1 : The voltage output 1 range is set to 125V. (Irrespective of normal or fault.)
AMP63.5 : The normal voltage 1 amplitude is set to 63.5V.
PHS0 : The normal voltage 1 phase is set to 0° .

Send CEP2 (⑥) to declare the following data represents voltage output 3. Data items from ⑦ to ⑨ are interpreted as the setting value for the voltage output 3.

RNG0 : The voltage output 3 range is set to 40V. (Irrespective of normal or fault)
AMP1 : The normal voltage 3 amplitude is set to 10V.
PHS90 : The normal voltage 3 phase is set to 90° .

Next send CES1 (⑩) to declare the following data represents the error values. Data items from ⑪ to ⑱ are interpreted as the error values. Error values are set respectively.
When ③ and ⑦ are used to set the range, the output is turned off automatically. Therefore, use ⑭ to turn the voltage output 1 on and ⑱ to turn the voltage output 3 on.
"CR/LF" (⑲) means the end of the data transmission. The actual setting of RX4718W starts at this point.

B) Response to query message

The following is the example of query message about the operational point when the operation mode is normal sweep [SWEEP].

- HDR1 CES2 CEP0 ?AMP “CR/LF”(program code transmission 1)
  The header is on, the status specification is sweep output, the phase specification is voltage and the query is on the amplitude.
- AMP 50.63 ” CR/LF”(response message reception 1)
  The voltage amplitude of sweep output is 50.63V.
- HDR0 ?PHS “CR/LF”(program code transmission 2)
  The header is off and the query is on the phase.
- -150.2 “CR/LF”(response message reception 2)
  The voltage phase of sweep output is -150.2°.

5.3 Program code list

Table 5-2 Program code list

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Master/slave	GRP	0: Separate 1: Master 2: Slave	Available	Not needed	Not needed	GRP1
Operation mode	MOD	0: Manual 1: HLD mode 2: NHD mode 3: Sweep 4: 1LG SWEEP 5: 2LS SWEEP 6: Operation・recovery time 7: 95 test 8: Search sweep 9: DSK search sweep 11: SOR quick change 13: 1LG search sweep 14: 2LS search sweep 15: 1LGDSK search sweep 16: 2LSDSK search sweep	Available	Not needed	Not needed	MOD1
Operation command	OST	0: Normal 1: Fault 2: Fault direction sweep 3: Normal direction sweep 4: Sweep stop	Available	Not needed	Not needed	OST2
PSW mode	PSW	0: Alternate 1: Momentary	Available	Not needed	Not needed	PSW1
Frequency mode	FMD	0: Internal 1: 50Hz fixed 2: 60Hz fixed 3: Line 4: External signal synchronization	Available	Not needed	Not needed	FMD1
Frequency (internal)	FRQ	10.000-200.000Hz	Available	Not needed	Not needed	FRQ50.5
Waveform selection	FNC	0: Sine 1: Harmonic 1 2: Arbitrary 6: +DC 7: -DC When internal DIP SW does not allow selecting DC waveform, +DC and –DC setting will be disabled.	Available	Not needed	Not needed	FNC0

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Code setting phase specification	CEP	0: voltage out 1 1: voltage out 2 2: voltage out 3 This command is used to assign setting values to each electric voltage out when electric voltage and phases are set. This command is also used to ask SETTING / DATA.	Available	＊＊	Needed	CEP0
Code setting status specification	CES	0: Normal (SOR step 1) 1: Fault (SOR step 4) 2: Sweep output 12: SOR step 2 13: SOR step 3 This command is used to assign setting values to each status when electric voltage and phases are set. This command is also used to ask SETTING / DATA.	Available	Needed	＊＊	CES1

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Amplitude	AMP	Voltage (except for +DC and -DC) 40V, 0.000 - 40.000V 125V, 0.00 - 125.00V 250V, 0.00 - 250.00V Voltage(except for +DC and -DC) 40V, 0.00 - 40.00V 125V, 0.0 - 125.0V 250V, 0.0 - 250.0V	Available	Needed	Needed	AMP 12.34
Phase	PHS	-359.9 - 359.9 °	Available	Needed	Needed	PHS120
Phase setting range switch	PLS	0: Minus On 1: Minus Off	Available	Not needed	Not needed	PLS0
Amplifier input selection	ISC	0: Internal 2: External output	Available	Needed	Not needed	ISC0
External output amplitude range	EMA	Voltage: 0.00-999.99V When a device such as a booster is used externally, the setting value is used as a full-scale value.	Available	Needed	Not needed	EMA20

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Balanced 3-phase	PBL	Setting of the output and status being a standard. 0: Normal V1 1: Normal V2 2: Normal V3 3: Fault V1 4: Fault V2 5: Fault V3	Not available	Not needed	Not needed	PBL2
1LG grounding phase specification	LGP	0:V1 1:V2 2:V3	Available	Not needed	Not needed	LGP1
1LG fault zero voltage	LGV	0.000～999.99V The upper value is limited with the range and factor.	Available	Not needed	Not needed	LGV12.3
1LG calculation	LGE	No parameters The calculation is executed with 1LG parameters that are set at the reception of this command.	Not available	Not needed	Not needed	LGE
2LS short-circuit phase specification	LSP	0:V1-V2 1:V2-V3 2:V3-V1	Available	Not needed	Not needed	LSP2
2LS fault line voltage	LSV	0.000～1732.0V The upper value is limited with the range and factor.	Available	Not needed	Not needed	LSV23.4
2LS calculation	LSE		Not available	Not needed	Not needed	LSE
Line to line voltage calculation	LVL	Query only 0: Normal V1-V2 1: Normal V2-V3 2: Normal V3-V1 3: Fault V1-V2 4: Fault V2-V3 5: Fault V3-V1 6: Normal Vo 7: Fault Vo	Available	Not needed	Not needed	LVL4
Phase change	PSH	0:V1>V2>V3 direction 1:V1<V2<V3 direction Phases are changed with the direction set with the parameter.	Not available	Not needed	Not needed	PSH1

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Output range	RNG	0: 40V 1:125V 2:250V	Available	Needed	Needed	RNG1
Output phase ON/OFF	OUC	0:OFF 1:ON	Available	Needed	Not needed	OUC1
Output at once ON/OFF	OTC	0:OFF 1:ON	Available	Not needed	Not needed	OTC1
Output selector mode	SCM	0: Side terminal 1 phase 1: Side terminal 3 phases 2: front terminal	Available	Not needed	Not needed	SCM2
Output selector 1 phase Ground fault/short-circuit	SCG	0: Ground fault 1: Short circuit	Available	Not needed	Not needed	SCG1
Output selector 1 phase Phase selection	SCP	0: R(ground fault), R-S(short circuit) 1: S(ground fault), S-T(short circuit) 2: T(ground fault), T-R(short circuit)	Available	Not needed	Not needed	SCP0
Output selector 3 phase Output selection	SRL	0:1L 1:2L	Available	Not needed	Not needed	SRL1
Output selector 3 phase Phase rotation phase selection	SCR	0:R 1:S 2:T	Available	Not needed	Not needed	SCP0
Selector communication function	GSC	0:OFF 1:ON	Available	Not needed	Not needed	GSC0

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Operation start input logic	STL	0: ↑ a RISE 1: ↓ b FALL	Available	Not needed	Not needed	STL0
Operation start input status	STR	Query only 0: Recovery 1: Operation	Available	Not needed	Not needed	?STR
Operation start stop setting	SPS	0: unused 1: used	Available	Not needed	Not needed	SPS0
Trip input logic	TRL	0: ↑ a RISE 1: ↓ b FALL	Available	Not needed	Not needed	TRL0
Trip input status	TRP	Query only 0: Recovery 1: Operation	Available	Not needed	Not needed	?TRP
Chattering time	CHT	0.001 - 0.100s	Available	Not needed	Not needed	CHT0.05
Chattering time control	CHC	0:OFF 1:ON	Available	Not needed	Not needed	CHC1
Fault duration	FLT	0.001 - 65.000s	Available	Not needed	Not needed	FLT1.23
Fault duration control	FLC	0:OFF 1:ON	Available	Not needed	Not needed	FLC0
Pre-trigger time	PTT	0.010 - 6.000s	Available	Not needed	Not needed	PTT0.123
Pre-trigger time control	PTC	0:OFF 1:ON	Available	Not needed	Not needed	PTC1
Fault start phase	FPH	0.0 - 359.9 °	Available	Not needed	Not needed	FPH90
Fault start phase control	FPC	0:OFF 1:ON	Available	Not needed	Not needed	FPC0

Function	Header	Function and range	Query	Phase specification	Status specification	Example
Timer mode	CNT	0: Interval 1: One-shot 2: Train 3: Start measurement	Available	Not needed	Not needed	CNT0
Timer clear	CCL	No parameters	Not available	Not needed	Not needed	CCL
Timer setting timer clear	CRS	0: Automatic 1: Manual	Available	Not needed	Not needed	CRS1
Timer setting automatic recovery	ART	0:OFF 1:ON	Available	Not needed	Not needed	ART0
Operation time measurement value	CMV	Used for query of the operation time measurement value. Data range 0.0001 - 999.99s	Available	Not needed	Not needed	?CMV
Recovery time measurement value	RTD	Use for query of the recovery time measurement value Data range 0.0001 - 999.99s	Available	Not needed	Not needed	?RTD
Fault waiting time	FTW	0.00 - 9.99s	Available	Not needed	Not needed	FTW0.5

Function	Header	Operation and range	Query	Phase specification	Status specification	Example
Sweep time	STM	1.0-1000.0s	Available	Not needed	Not needed	STM123
Seep position	MSP	0.00 - sweep time s This command is issued to move to an arbitrary sweep position.	Available	Not needed	Not needed	MSP 12.34
Manual sweep	MSC	0:OFF 1:ON	Available	Not needed	Not needed	MSC1
Search･DSK sweep times	SWT	Set sweep times 2 - 10	Available	Not needed	Not needed	SWT3
Search ･DSK sweep judge time	JTM	0.1 - 10.0s	Available	Not needed	Not needed	JTM5.0
DSK sweep trip wait time	TTM	0.1 - 10.0s	Available	Not needed	Not needed	TTM3.0
Search･DSK sweep output cut	SOC	0: Unused 1: Used	Available	Not needed	Not needed	SOC1

Function	Header	Function and range	Query	Phase specification	Status specification	Example
95 test Crossover frequency	FCF	10.000 - 200.000Hz	Available	Not needed	Not needed	FCF48.5
95 test Sweep speed	FSS	0.001 - 9.999Hz/s	Available	Not needed	Not needed	FSS1.23
95 test Hold time	FRW	0.01 - 9.99s	Available	Not needed	Not needed	FRW3.45
95 test Amplitude quick change control	FAQ	0:OFF 1:ON	Available	Not needed	Not needed	FAQ0
95 test Operation frequency	FAF	Query only 10.000 - 200.000Hz	Available	Not needed	Not needed	?FAF
95 test Operation time	FAT	Query only 0.0001 - 999.99s	Available	Not needed	Not needed	?FAT
95 test Recovery frequency	FRF	Query only 10.000 - 200.000Hz	Available	Not needed	Not needed	?FRF
95 test Recovery time	FRT	Query only 0.0001 - 999.99s	Available	Not needed	Not needed	?FRT

Function	Header	Operation and range	Query	Phase specification	Status specification	Example
Measurement status read	MST	Query only This is a status to show that the measurement ends correctly. When it ends correctly, 0 is shown. When no measurement value is obtained, the following values are used. Normal sweep 1 1LG sweep 2 2LS sweep 4 95 test 8 Search sweep 16 DSK search sweep 32 HLD mode 64 NHD mode 128 Simultaneous operation・recovery measurement 256 SOR mode 512 1LG search sweep 1024 2LG search sweep 2048 1LGDSK search sweep 4096 2LSDSK search sweep 8192	Available	Not needed	Not needed	?MST

Function	Header	Operation and range	Query	Phase specification	Status specification	Example
Harmonic wave 1 amplitude	HAM	First parameter Harmonic wave degree: 1 to 25 Second parameter Harmonic wave amplitude: 0.0 to 100.0% In this example, the third amplitude is set to 8.5%.	Available	Needed	Needed	HAM 3,8.5
		Specify the degree of the harmonic wave to ask the values. In this example, the third harmonic wave amplitude is asked.				?HAM3
Harmonic wave 1 phase	HPH	First parameter Harmonic wave degree: 1 to 25 Second parameter Harmonic wave phase: 0 to 359 ° In this example, the third phase is set to 120 degrees.	Available	Needed	Needed	HPH 3,120
		Specify the degree of the harmonic wave to ask the values. In this example, the third harmonic wave phase is asked.				?HPH3
Harmonic wave 1 calculation	HCL	No parameters When the waveform obtained from the calculation exceeds the peak of sine wave in the full-scale range, an error will be displayed.	Not available	Needed	Needed	HCL

Function	Header	Operation and range	Query	Phase specification	Status specification	Example
Arbitrary waveform data format	FMT	0: ASCII format (ASCII) 1: Binary format (BINARY) When RS-232C is used, only ASCII data is accepted. If binary format is specified, an error will occur.	Available	Needed	Needed	FMT1
Arbitrary waveform starting address	STT	0 to 4095	Available	Needed	Needed	STT1000
Number of arbitrary waveform transmission data items	WDN	1 to 4096 Because the data buffer can contain up to 1024 bytes of data, delimiters should be used to prevent buffer overflow.	Available	Needed	Needed	WDN512
Start writing of arbitrary waveform data	SET	No parameters	Available	Not needed	Not needed	SET
Read block length of arbitrary waveform data	BLK	1 to 4096	Available	Needed	Needed	BLK512
Start reading of arbitrary waveform data	OUT	No parameters	Not available	Needed	Needed	OUT

Function	Header	Operation and range	Query	Phase specification	Status specification	Example
Beep setting	BEP	0: OFF 1: ON	Available	Not needed	Not needed	BEP0
Expanded external response input	SRI	0 to 255	Available	Not needed	Not needed	SRI3
Writing of panel setting memory	STO	First parameter Memory number: 0 to 31 Second parameter Comment Comment is asked. In this example, current setting value and comment “reset” are put in memory 0.	Available	Not needed	Not needed	STO0, Reset
Reading of panel setting memory	RCL	0 to 33 When an attempt is made to read an unrecorded memory number, an error occurs.	Not available	Not needed	Not needed	RCL10

Function	Header	Operation and range	Query	Phase specification	Status specification	Example
Header ON/OFF	HDR	0: OFF 1: ON	Available	Not needed	Not needed	

SRQ mask	MSK	0 to 63 This mask is used to select SRQ signaling factors. Select appropriate factors out of the following list and add up the corresponding numbers. The resulting number will make a mask. After the number is set, SRQ will be prohibited. To release all the prohibitions, zero should be set. When MSK60 is set, SRQ will occur at the completion of timer measurement or stopping of sweep. 32 Error occurrence 16 V output overload occurrence 8 I output overload occurrence 4 Unused 2 Completion of timer measurement 1 Stop of sweep	Available	Not needed	Not needed	MSK60
Status byte	STS	Query only. This query command is issued to check the status shown below. The numbers corresponding to each occurrence factor are added up and returned. 64 SRQ occurrence 32 Error occurrence 16 V output overload occurrence 8 I output overload occurrence 4 Unused 2 Completion of timer measurement 1 Stop of sweep	Available	Not needed	Not needed	?STS
Error code	ERR	Query only This command is issued to ask error status. An error number is returned. ☞ “7.1Error message“	Available	Not needed	Not needed	?ERR
Machine type	IDT	Query only This command is issued to ask machine type. [IDT 4718] is returned.	Available	Not needed	Not needed	?IDT
Version	VER	Query only This command is issued to ask the software version of RX4718W. A character string like [VER 3.00] is returned.	Available	Not needed	Not needed	?VER

6. RS-232C interface

6.1 Overview of RS-232C

RS-232C is an interface standard that is used between data communications equipment and computers or data terminal equipment. This interface is established JIS X 5101 “INTERFACE BETWEEN DATA CIRCUIT-TERMINATING EQUIPMENT (DCE) AND DATA TERMINAL EQUIPMENT (DTE)” and American EIA.

Serial data transmission is used and developed in communications area. If data should be transmitted from a distance, signals are modulated and sent, then they are demodulated and received by a modem. This is the most popular method for long distance communications. RS-232C is a interface standard of modems. Data terminal equipment and modems have the appropriate specifications. The connection between the two is shown in “Figure 6-1 RS-232C connection.“

The RS-232C interface is used to connect personal computers. As the interface develops, RS-232C is gradually employed for instrumentation connection. When connecting a computer with an instrument through RS-232C interface, you can connect them without a modem because the distance between the two is short. In this case, the RS-232C interface is not used for original purpose, each side has two roles, a computer and data terminal equipment, causing an interface trouble. To avoid this trouble, the one side is used as a modem or a cross cable that connects input of one side to output of the other side and output of one side to input of the other side is used. An example of a cross cable connection is shown in “Figure 6-2 Connection without modem.“

Compare to GPIB, RS-232C is used irregularly, so you should check the specifications of the devices to be connected carefully, use appropriate cables, and make appropriate programs that match the system.

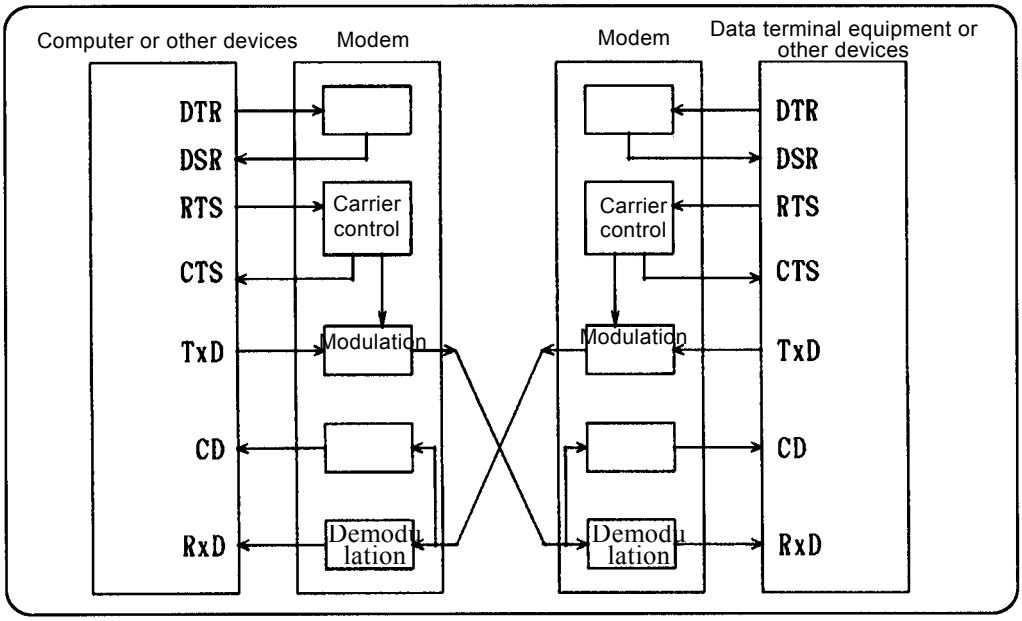
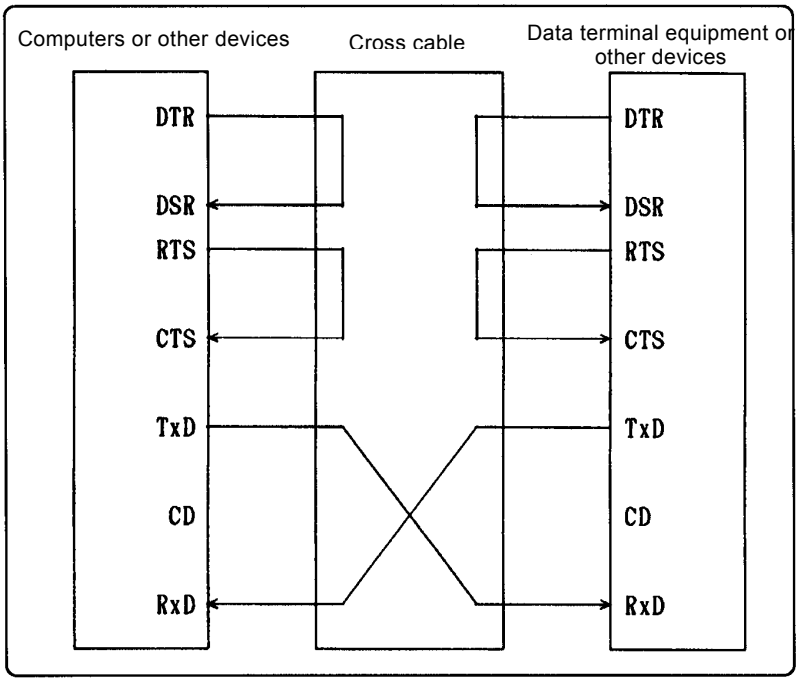


Figure 6-1 RS-232C connection



Abbreviations

CD : Carrier Detect

CTS : Clear To Send

DSR : Data Set Ready

DTR : Data Terminal Ready

RTS : Request To Send

RxD : Received Data

TxD : Transmitted Data

Figure 6-2 Connection without modem

6.1.1 Specifications of RS-232C

■ Mutual connection equivalent circuit

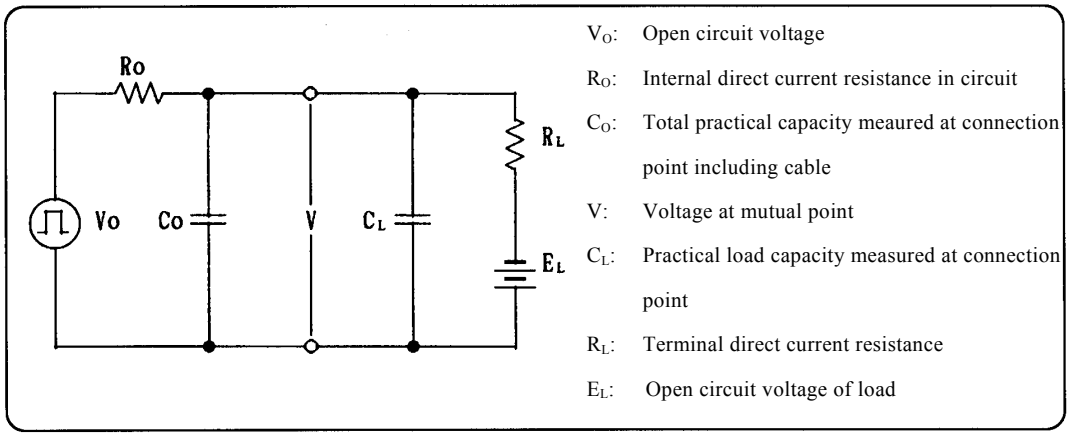


Figure 6-3 Mutual connection equivalent circuit

■ Receiver

Input impedance (R_L)	:	3kΩ-7kΩ (at the applied voltage of 3 to 25V)
Practical local capacity (C_L)	:	2500pF or less
Signal identification voltage "1":		-3V or less
"0" :		+3V or more
Open circuit voltage (E_L)	:	2V or less

■ Driver

Maximum open circuit voltage (Vo)	:	±25V or less
Maximum current at short-circuit	:	±0.5A or less
Logic output level "1"	:	-15 to -5V
"0"	:	+15 to +5V
Output impedance (Ro)	:	300Ω or less

■ Connector

The connector on the data terminal equipment is shown in "Figure 6-4 Connector on connection cable."

6.2 RX-232C interface of RX4718W

The RS-232C interface of RX4718W has almost the same functions as GPIB of RX4718W. Parameter setting, parameter transmission, and data transmission can be performed.

The RX-232C interface can not be used with GPIB simultaneously. The following settings are not available for RS-232C.

Power ON/OFF
Setting of GPIB (addresses and delimiters)
Setting of RS-232C (baud rate, stop bit length, parity)
Operation of MODIFY

Comparing to GPIB, RS-232C has the following disadvantages. GPIB will enable quicker and more sophisticated control.

- Because RX4718W and a computer are connected one to one, one computer cannot control multiple devices. When you want to use multiple RX4718W to construct multiple phase protection relay testers with master/slave connection and to control them by a computer, you should use GPIB.
- Because data is transmitted through serial line, the transmission speed is slower than GPIB that uses 8-bit parallel line.
- Because interrupts corresponding to SRQ of GPIB cannot be used, efficient program cannot be made.

6.2.1 Specifications

RX4718W RS-232C uses the specifications of the data terminal equipment that are based upon "JIS C 6361 LOW-SPEED ASYNCHRONOUS MODEM INTERFACE."

Communication mode	:	Asynchronous
Baud rate	:	300, 600, 1.2k, 2.4k, 4.8k, or 9.6k
Data bit length	:	8 bits
Stop bit length	:	1 bit or 2 bit
Parity	:	EVEN, ODD or NONE
Output signal	:	±12V, equivalent for driver SN75188N
Input signal	:	Maximum of ±30V, equivalent for receiver SN75189AN

Input and output operations cannot be conducted simultaneously.

6.2.2 Connector and signal line

The pin numbers of the connector are shown in "Figure 6-5 Connector of data circuit-terminating equipment."

Connector fixing screws are M2.6.

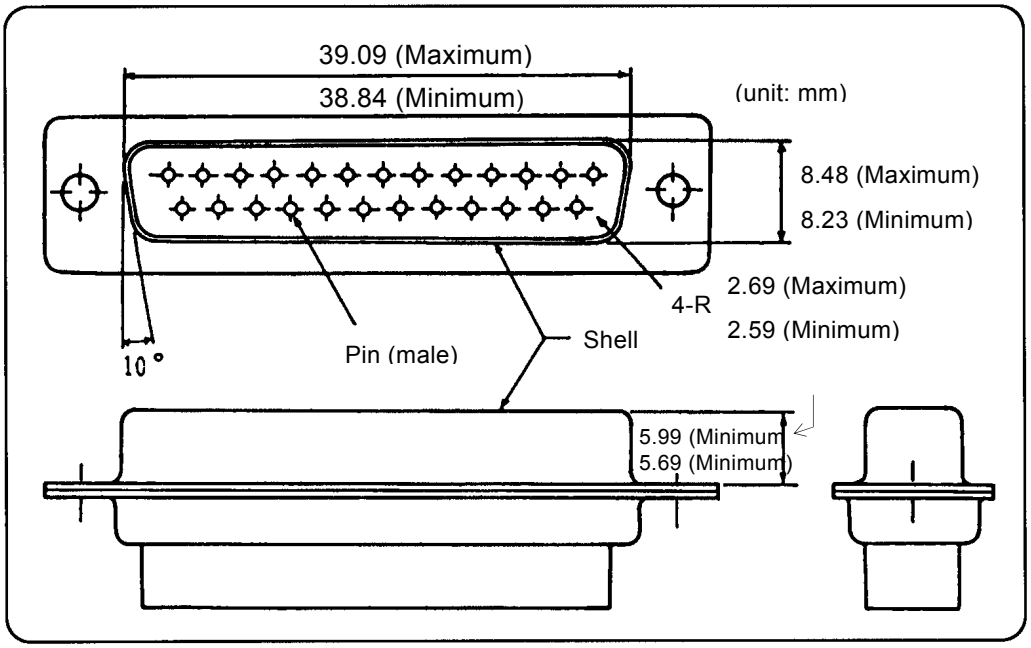


Figure 6-4 Connector on connection cable

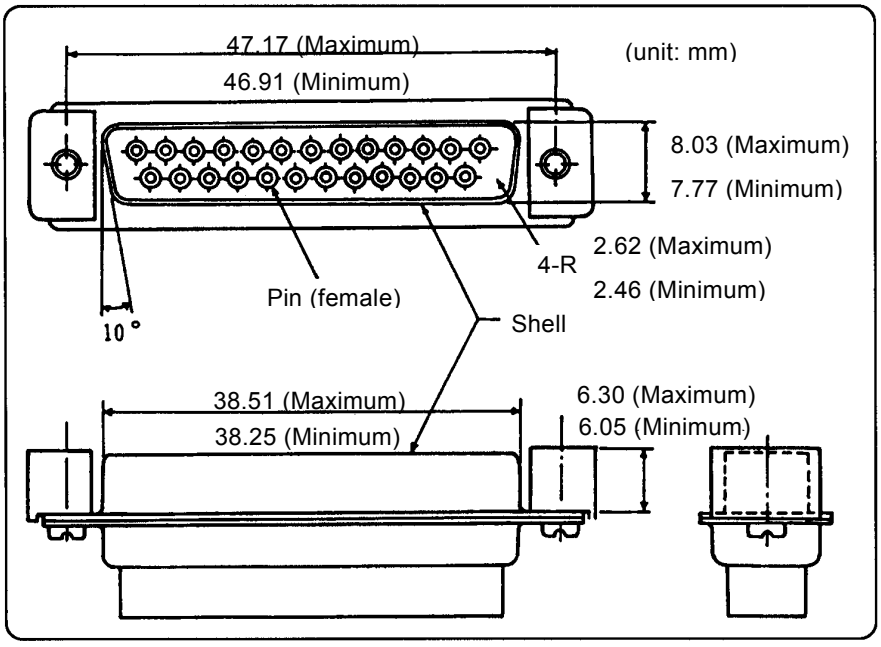


Figure 6-5 Connector of data circuit-terminating equipment

Table 6-1 Types and their explanation of RS-232C

Pin number	Name	Abbreviation	Explanation	Direction
1	Frame Ground	FG		
2	Transmitted Data	TxD	Data output signal line from RX4718W.	Output
3	Received Data	RxD	Data input signal line to RX4718W.	Input
4	Request to Send	RTS	"H" when data output from RX4718W starts. "L" when data output ends.	Output
5	Clear To Send	CTS	"H" to enable data output from RX4718W. Originally modem returns "H" to CTS in response to RTS. When response from the receiving side is not necessary, connect CTS to RTS directly. This pin can be used as BUSY for receiving side.	Input
6	Data Set Ready	DSR	"H" to enable data output from RX4718W. When DSR is set to "L" and RX4718W is put into output status, it becomes "Er6." If this signal input is not necessary connect DSR to DTR directly.	Input
7	Signal Ground	SG		
20	Data Terminal Ready	DTR	"H" when RX4718W is in RS-232C mode. "L" when RX4718W is in GPIB mode.	Output

6.2.3 Connecting connector lines

Because no standard cables are produced unlike GPIB, lines should be connected to match the specifications of the equipment to be used through RS-232C interface without a modem.
An example of line connection between RX4718W (data terminal equipment) and the other data terminal equipment is shown below. Study the specifications of equipment to be connected before actual connection.

■ Minimum connection

Frame ground 1 is not separated from signal ground 7 in this equipment.

RX4718W	Pin No		Pin No	Host computer
Frame grand	1		1	Frame ground
Transmitted data	2		2	Transmitted data
Received data	3		3	Received data
RTS	4		4	RTS
CTS	5		5	CTS
DSR	6	Note	6	DSR
Signal ground	7		7	Signal ground
DTR	20		20	DTR

Note: Actual line connection should be done with careful study of the specifications of the equipment or programs.

■ When checking mutual connection

Frame ground 1 is not separated from signal ground 7 in this equipment.

RX4718W	Pin No		Pin No	Host computer
Frame ground	1		1	Frame ground
Transmitted data	2		2	Transmitted data
Received data	3		3	Received data
RTS	4		4	RTS
CTS	5		5	CTS
DSR	6		6	DSR
Signal ground	7		7	Signal ground
Unused	8		8	CD
DTR	20		20	DTR

6.2.4 Setting of RS-232C

RX4718W contains two interfaces, GPIB and RS-232C. Since they can not be used simultaneously, one of them needs to be set.

Use of RS-232C, setting of baud rate and each parameter are done by the other function and the set values are backed up with batteries if the power is turned off.

To use RS-232C, turn the RS-232C on. When RS-232C is turned on, GPIB will be automatically turned off. On the contrary, when RS-232C is turned off, GPIB will be automatically turned on.

The setting parameters of RS-232C are as follows.

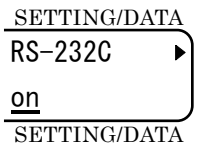
Use of RS-232C	:	ON/OFF
Baud rate	:	300, 600, 1.2k, 2.4k, 4.8k, or 9.6k
Stop bit length	:	1 bit or 2 bit
Parity	:	EVEN, ODD, or NONE

- Setting procedure

  Press SHIFT+OTHER FUNC to display the other function on the 【SETTING / DATA】.

  Rotate MODIFY and select [RS-232C].

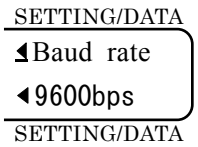
  Move the cursor with ▼ and turn MODIFY to select [on].



  Move the cursor up with ▲ and press ▶.

  Rotate MODIFY and the following parameters are selected.

Baud rate	[BAUD RATE]
Stop bit length	[STOP BIT]
Parity	[PARITY]



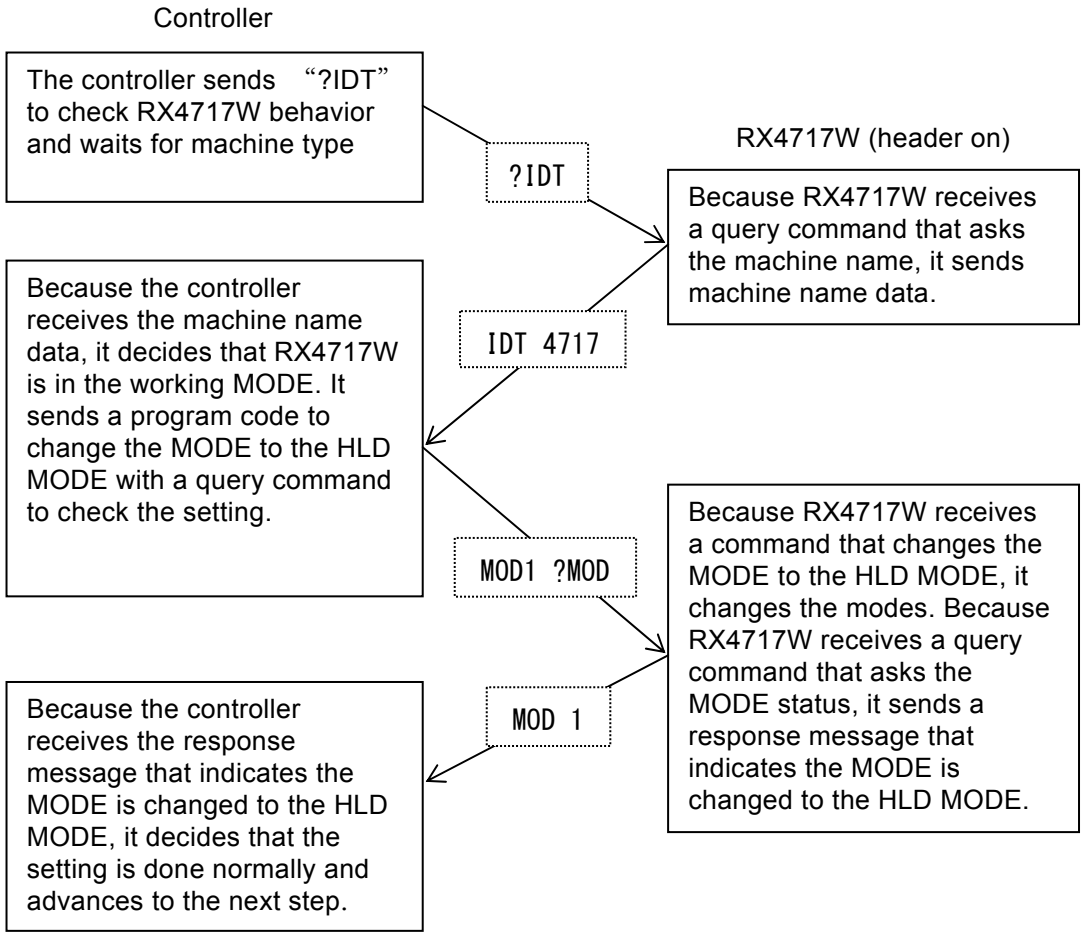
  Move the cursor down with ▼ to select each parameter with MODIFY.

6.2.5 Setting of program codes

The program codes of RX4718W RS-232C interface are the same as those of GPIB.

Because RS-232C does not have handshake function unlike GPIB, you should append a query message to a program code to control RX4718W. You should advance to the next step after receiving a response from RX4718W. This secures the reliable operation. Changing of the range and turning on or off are time-consuming transactions, but they should be checked carefully in every step.

■ Setting example



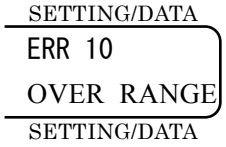
7. Troubleshooting

7.1 Error message

If abnormality is detected at the self test when the power is turned on, the error message is shown on the lower fluorescent display.
The following table shows the error messages. Please contact us or our sales agency if the error message occurs.

Table 7-1 List of error messages when the power is turned on

No	Message	Error content
1	ROM CHECK ERROR	An error occurred in the ROM used in the RX4718W. RX4718W fault.
2	RAM CHECK ERROR	An error occurred in the RAM used in the RX4718W. RX4718W fault.
3	CHECK SUM ERROR	The batteries used for memory backup was discharged and the data could not b e retained.



When an error occurred in the normal operation, the error number and error message are displayed on the 【SETTING / DATA】 and a long beep sounds if the beep setting is on.
The display of the error number and error message will disappear with the press of keys other than NORMAL (operation by the press of key is not effective at this time) and the normal operation will be returned.
The following table shows the error contents.

Table 7-2 List of error messages in normal operation

No.	Message	Error content
10	OVER RANGE	The set value entered by the numeral buttons was outside the range.
11	V1AMP OVER	3 sec or more have elapsed after the voltage amplifier 1 was overloaded.
12	V2AMP OVER	3 sec or more have elapsed after the voltage amplifier 2 was overloaded.
13	V3AMP OVER	3 sec or more have elapsed after the voltage amplifier 3 was overloaded.
14	NO DATA	The panel setting memory with no data stored in was tried to read. Or the panel setting memory content disappeared because the battery which backs up the memory was over discharged.
15	INPUT ERR	Data was entered in unspecified format from the numeral buttons.
16	TIMER OVER	The timer value exceeded its maximum value (9999.9 sec.).
20	SWEEP ERR	The set value of each amplitude phase during a sweep of 1LG or 2LS is not appropriate as the set value of 1LG or 2LS.
21	RANGE ERR	Ranges are not the same when three phases are set at once.
23	HARM ERR	The sum total of amplitude percentages of harmonic 1 is too large to fit in waveform memory.
24	PARAMET ERR	An error occurred in calculation of 1LG and 2LS.
25	NOW EXT OUT	The range was set or ON/OFF setting was selected when the amplifier input selection is “external output”.
27	NOW F SWEEPIN	In 95 test mode, frequency mode was set in other than “Internal”.

No.	Message	Error content
30	HEADER ERR	A header not found in the specification was set when a program code was set by GPIB/RS-232C.
31	SYNTAX ERR	The parameters set by the GPIB/RS-232C do not conform to the specified

		format.
35	FRQMODE ERR	A frequency was set while no frequency mode was internally set by the GPIB/RS-232C.
36	NOW SWEEPINX	A command other than "?STS" and "OST" was sent by the GPIB/RS-232C during a sweep.
37	CHARACT OVER	10 or more characters were set in a comment in the panel setting memory by the GPIB/RS-232C.
38	INTERVALFIX	An item other than interval was set by a GPIB/RS-232C command in simu ltaneous operation/recovery measurement mode.
40	PARITY ERR	A parity error occurred in RS-232C transfer data.
41	OVER RUN	An overrun error occurred in RS-232C transfer data.
42	FRAMING ERR	The RS-232C transfer data stop bit mismatched.
43	BUFFER OVER	Data of 1025 or more characters was transferred at a time when a progra m code was set using the GPIB/RS-232C.
44	FORMAT ERR	A format error occurred when a program code was set using the GPIB/RS-232C.

7.2 Handling apparent faults

When using the RX4718W, if an apparent fault phenomenon occurs although there is no error indication, make sure that there is no error in the operation, usage and connections with reference to the following.

If none of them is applicable, it may be a fault. Leaving the problem unattended may lead to a secondary fault and is dangerous. Prevent the power from being turned ON and contact NF CORPORATION or our sales agent.

■ The voltage amplitude set value does not match the output value.

- A waveform other than a sine wave is set in the waveform selection.
  Set the sine wave in the waveform selection.
  ☞"3.4.3 Waveform selection"
- The load connection is not correct.
  The voltage amplifier selects the output according to the setting of the output selector. Make sure to connect the load connection correctly.
  ☞"3.3.4 Output "

■ A trip signal operates incorrectly, preventing measurement of the operation time.

- The trip signal voltage is not appropriate.
  When the trip signal is a voltage signal, the threshold voltage of RX4718W is selected from +50V, +8V and +2.5V. Select a value with a sufficient margin with respect to the trip signal voltage of the protective relay measured.
  ☞"3.1.1 Left side panel"
  Due to a high leakage current of a trip signal, the non-operation voltage of some protective relay when connected to the RX4718W, exceeds +50V.
  In such a case, connect a resistor with a few kΩ in parallel to the trip signal input terminal so that the non-operation voltage may be low enough compared to 50V.
- The trip signal contains chattering.
  When the timer mode is ONE-SHOT, the width of chattering will be measured if the trip signal contains chattering.
  Use the trip input chattering correct function to remove the chattering.
  ☞"3. 5. 1. B) Setting of trip input chattering correction function"

■ It does not quickly change to fault/ sweep does not operate.

- The trip input logic setting is not correct.

  In standard setting, the trip input operates when the voltage is applied (or the contact is short-circuited) and returns when the voltage is removed (or the contact is opened). However, some protective relays have the opposite logic and the trip input logic setting can reverse the signal input logic.

  If this setting is not correct, quick change to fault does not occur in the quick change mode and sweeping does not occur in the sweep mode.

  Set the trip input logic setting correctly.

  ☞"3.5.1.A) Setting of [TRIP INPUT] logic"

- The operation start input logic setting is not correct.

  When the operation start command is given by the operation start input, the operation does not start if the input logic setting is not correct.

  Set the operation start input logic setting correctly.

  ☞"3.5.1.C) Setting of operation start input logic"

■ The timer does not operate even if a quick change is made by an external signal.

- The external signal is not connected to the operation start input.

  The quick change command input and quick change control signal input of RX4718W are to make the RX4718W in the normal/fault status directly and the timer does not operate.

  The operation start input of the RX4718W is an operation start command for each operation mode. To operate the timer, make the quick change with the operation start input.

  ☞"4.4.2 Synchronization of quick change operation"

- The operation start input signal contains chattering.

  When the quick change is occurred by the operation start input, set the stop setting to [off] if the signal contains chattering.

  When the stop setting is [on], it may returns to normal immediately or fault may occurs again if the input signal contains chattering and the timer does not operate properly.

  ☞"3.5.1.D) Stop Function of operation start input "

■ A quick-change operation causes the hang-up or the RX4718W not to operate.

- The power supply capacity is not sufficient.

  Using a table tap or cable reel causes high impedance of the power supply line. When the RX4718W is quickly changed and the electric power consumption is increased rapidly, this impedance reduces the power supply voltage, which may prevent normal operation of this equipment.

  Supply the power to the RX4718W by directly plugging the power cable to the receptacle.

■ Key operation does not work.

- Key lock or cursor off setting is selected.
  This problem occurs when LED of KEY LOCK or CURSOR ON/OFF is turned on.
  In case of KEY LOCK, pressing SHIFT+LOCK OFF turns LED off and the key lock is canceled.
  In case of CURSOR OFF, press CURSOR ON/OFF to turn the LED off and turn on the cursor.
- GPIB is a remote setting.
  In remote setting, LED of GPIB LOCAL is turned off. Press GPIB LOCAL (LED will be lit on) to make it the local setting.
  ☞"5.2.4 Remote/local behavior"

■ GPIB and RS-232C do not operate properly.

- GPIB setting and RS-232C setting are not correct.
  RX4718W is equipped with two interfaces, GPIB and RX-232C but they can not be used at the same time.
  To use GPIB, set it correctly. The redundancy of GPIB address between devices or the wrong address often causes the error.
  ☞"5.2.3 Setting of GPIB"
  To use RS-232C, set it correctly.
  ☞"6.2.4 Setting of RS-232C"
- The operating environment is not good such as presence of external noise.
  GPIB and RS-232C are the interfaces which should be used in the good operating environment.
  Avoid using them in the operating environment where external noise is present.

■ The power is not turned on.

- The setting of the power supply input selector switch is not correct.
  Set it correctly.
  ☞"2.3 Grounding and power supply"

■ LED of FAULT remains on.

- Master/slave setting is not correct.
  RX4718W remains the LED of FAULT on if it is set to slave when the supplied master/slave control daisy-chain cable is not connected to the parallel control signal.
  Set it to "Separate" if the RX4718W is used as a single unit.
  ☞"4.1.1 Master/slave setting"

8. Maintenance

8.1 Daily cleaning

■ When the panel or case is dirty

Wipe it with a soft cloth. When the stain is hard to remove, use the cloth dipped in the neutral detergent. Never use volatile solvent like thinner or benzene or a wipe because it may degenerate the panel/case or damage the coating.

■ Removal of dust inside

RX4718W uses air cooling with blower to make it light and small. If it is used in the dusty environment, dust may enter inside resulting in the insulation failure and contact failure.
We clean the inside of the RX4718W when calibration is performed. Regular calibration is recommended.

8.1.1 Memory backup battery

While the RX4718W is connected to the power, the battery used for backup is charged with a low current.
A memory backup period when the battery is fully charged is about 60 days but it varies depending on the product and also varies depending on the ambient temperature.
It takes approximately 100 hours to charge the battery from a fully discharged condition to a fully charged condition. Then, if the battery is kept charged for over 200 hours a week, it keeps a fully charged condition. Continuous charging will not cause overcharging.
When the battery deteriorates, its backup period becomes shorter. If it comes to a point where the battery is no longer useful, our company will replace it with a new one at cost to customer.
Since the useful life of the battery greatly changes according to the operating conditions (charging state, ambient temperature, ambient humidity), it is meaningless to generalize, but if the battery maintains its fully charged condition, it is expected to take 3 to 5 years until the battery capacity reduces by half.
Storing the battery without charging for 6 months or more may drastically shorten the useful life of the battery, and therefore it is recommended to sometimes connect the power to the RX4718W.

8.2 Storage･Repacking･Transportation

■ Storage when RX4718W is not used for a long term

- Disconnect the power cable from the receptacle and the RX4718W.
- Store the RX4718W on the shelf or rack to avoid any falling objects and dust.
- Put the cloth or plastic cover on the RX4718W if dust may be accumulated.
- The temperature range for storage is from –10 to +50℃ and the relative humidity range is from 5 to 95％RH. Avoid the place where radical temperature change may occur or the direct sunlight and store the RX4718W at room temperature.

■ Cautions for repacking and transportation

- Cover the RX4718W with a plastic bag or sheet.
- Prepare a cardboard box which tolerates the weight of the RX4718W with a sufficient room. When packing, protect the RX4718W by placing the cushioning materials into its six sides.
- For transportation, instruct the transportation company that the RX4718W is a precision instrument.

8.3 How to check the version number

When the power of RX4718W is turned on, the version number of the built-in software is displayed on the 【SETTING / DATA】.

SETTING/DATA
4717
Ver X.XX
SETTING/DATA

In addition, the version number can be inquired using “?VER” command of GPIB and RS-232C.

8.4 Performance test

To guarantee the performance of RX4718W, calibration needs to be performed by us. Regular calibration is recommended to guarantee the performance.
This chapter describes the items tested without using special tools or measurement instruments among key items. If the test result shows that some items do not satisfy the specification, calibration or repair will be needed.
Ask us for the detail of tests, calibration or repair.

8.4.1 Preparation before performance test

Check the following items before performance test.

That the power line voltage is within the rating (AC 85 to 115V or 180 to 240V).
That the ambient temperature is within the range of +15 to +35℃.
That the ambient humidity is within the range of 5 to 85％RH.

Prepare the measurement instrument and load non-inductive resistance equivalent to the followings.

Power multimeter (**2721**)	volts alternating current･alternating current: within ±0.1%, phase: within ±0.1°
Universal timer	accuracy 1×10^{-6} or more
Distortion rate meter	full scale 0.1% or less
Voltage load	200Ω 20W 40V range 156Ω 200W 125V range 1250Ω 100W 250V range

8.4.2 Output amplitude･phase

Power multimeter (**2721**)

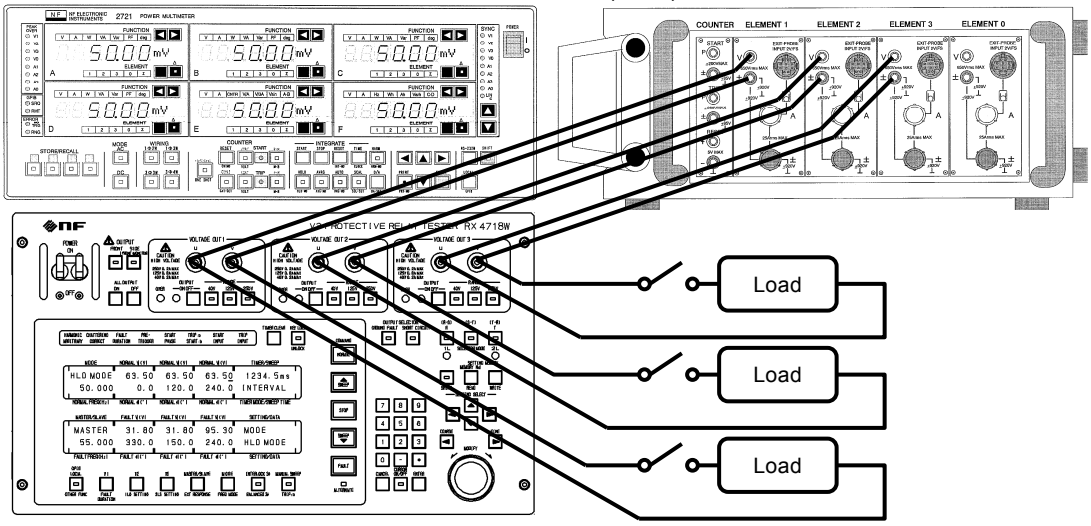


Figure 8-1 Connection of power multimeter (2721) and load

■ Amplitude accuracy

The load is opened.

Set each range to its full-scale value and check that the accuracy is within the following range.

Amplitude accuracy: within ±0.5% of the full-scale value for each range (±0.2% typ.)

■ Phase accuracy

The load is opened.

The phase accuracy of the voltage 2 and 3 is calculated with 63.5V in 125V range of voltage 1 as a reference, and the phase accuracy of the voltage 1 is with 63.5V in 125V of voltage 3 as a reference.

Set each range to its full-scale value and check that the accuracy is within the following range.

Phase accuracy: within ±0.3°

■ Load regulation

The load regulation is calculated from the measurement value when the rated load is connected with the load open (no load) as a reference

Set at the full-scale values for each range and check that each load regulation meets the following range.

Load regulation of amplitude: within ±0.2% (when the rated output amplitude･load variation is 100%.)

Load regulation of phase: within ±0.2° (when the rated output amplitude･load variation is 100%.)

8.4.3 Distortion rate

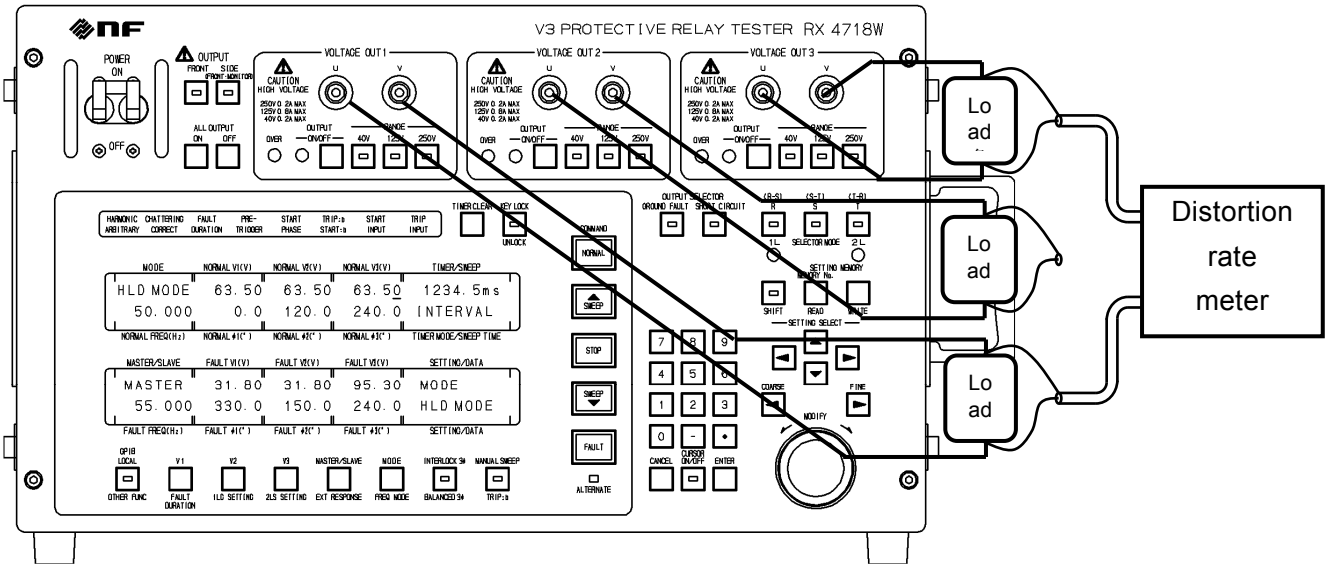


Figure 8-2 Connection of a distortion rate meter and load

Connect the rated load. Set each range to its full-scale value and check that the distortion rate of each load is within the following range.

Distortion rate: within 0.5% (at pure resistance rated load・rated voltage)

8.4.4 Frequency accuracy

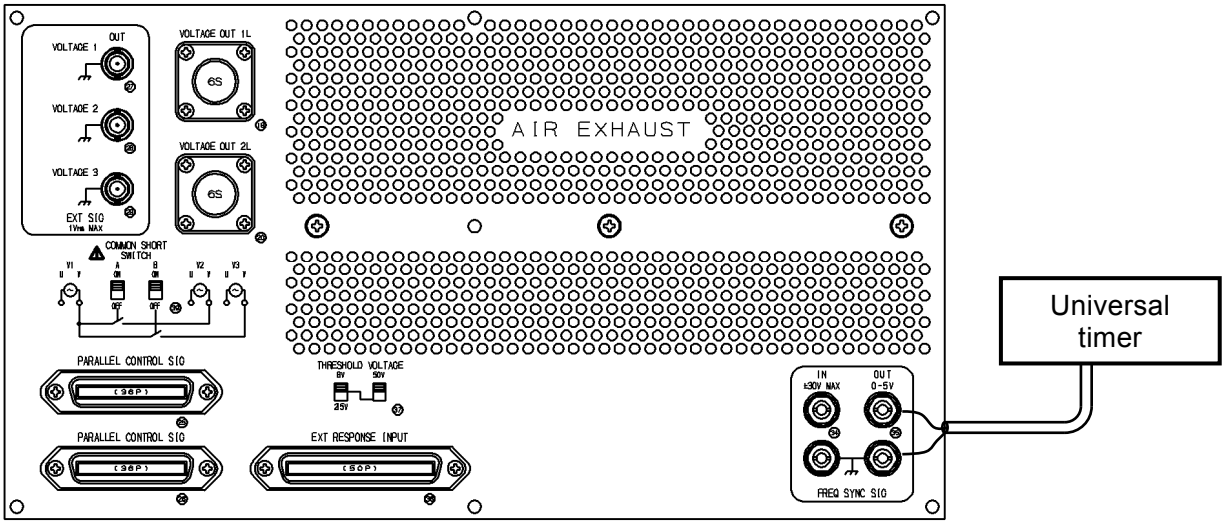


Figure 8-3 Connection of a universal timer (frequency accuracy)

Set the frequency mode to 50Hz FIX and 60Hz FIX. Check that the frequency accuracy meets the following range.

Frequency accuracy: within ±30ppm

8.4.5 Timer accuracy

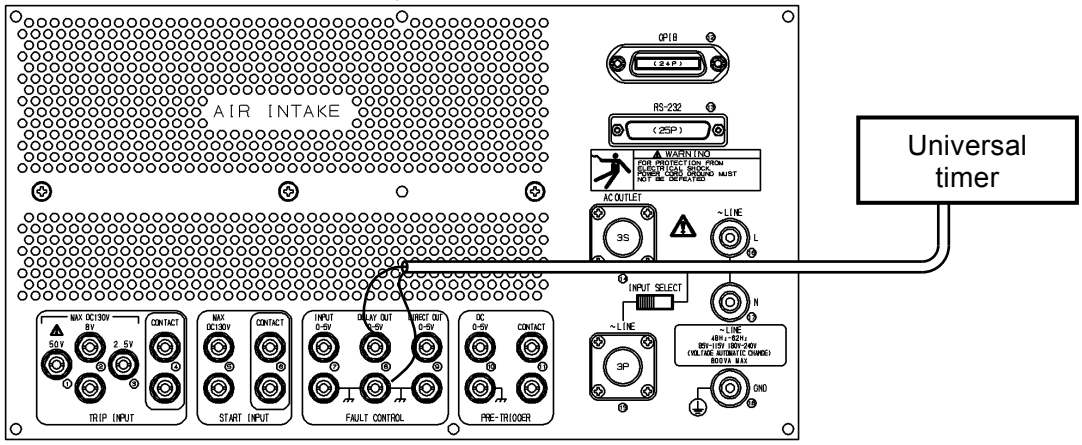


Figure 8-4 Connection of a universal timer (timer accuracy)

Set the operation mode to [HOLD MODE] and the timer mode to [INTERVAL].
Set the universal timer to the mode which measures the time from fall to rise.
Turn the fault duration function on and initiate the quick change to fault with the fault duration setting of 100ms, 1s, and 10s. After the fault duration has elapsed, the system returns to normal and the timer stops.
With a measurement value of the universal timer as a standard, check that the accuracy of the timer value of RX4718W meets the following range.

Timer accuracy: within ±(0.01%+1digit)

Note: The fault duration fluctuates about ±10ms.

9. Specification

9.1 Voltage output rating

9.1.1 AC output

		Voltage output three phases		
Rated output range		40V	125V	250V
AC output voltage range		0 to 40V	0 to 125V	0 to 250V
AC output current range		0 to 0.2A	0 to 0.8A Note 1	0 to 0.2A
Allowable load power factor		0.7-1.0 (delay)		
Rated load Note 2		200Ω	156Ω	1250Ω
Amplitude accuracy		Within ±0.5% of each range full scale (±0.2% typ.)		
Phase setting range		-359.9° to +359.9° (delay setting)		
Phase accuracy		Within ±0.3°		
Set resolution	Amplitude	1mV	0.01V	0.01V
	Phase	0.1°		
Load regulation	Amplitude	Within ±0.2% (with rated output amplitude, load variation 100%)		
	Phase	Within ±0.2° (with rated output amplitude･load variation 100%)		
Line regulation	Amplitude	Within ±0.1% (with rated output amplitude･power variation ±10%)		
	Phase	Within ±0.1° (with rated output amplitude･power variation ±10%)		
Distortion rate		Within 0.5% (with pure resistance rated load･rated output)		

The unit is effective value (rms) unless specified otherwise.

The rating above applies when the output frequency is 48Hz to 62Hz and is a sine wave.

The rating above applies when the ambient temperature is +15 to +35℃ and the ambient humidity is 5 to 85%RH.

The output voltage is specified by the output terminal. The phase is specified by a relative value at each output.

Quick changes and sweeps are only possible within the same range.

Note 1: The output current available becomes smaller when the voltage output is 63.5V or les s

☞"Figure 9-1 Output voltage characteristics in the 125V range of voltage output"

Note 2: The rated voltage output load has the minimum available resistance at the maximum v oltage output.

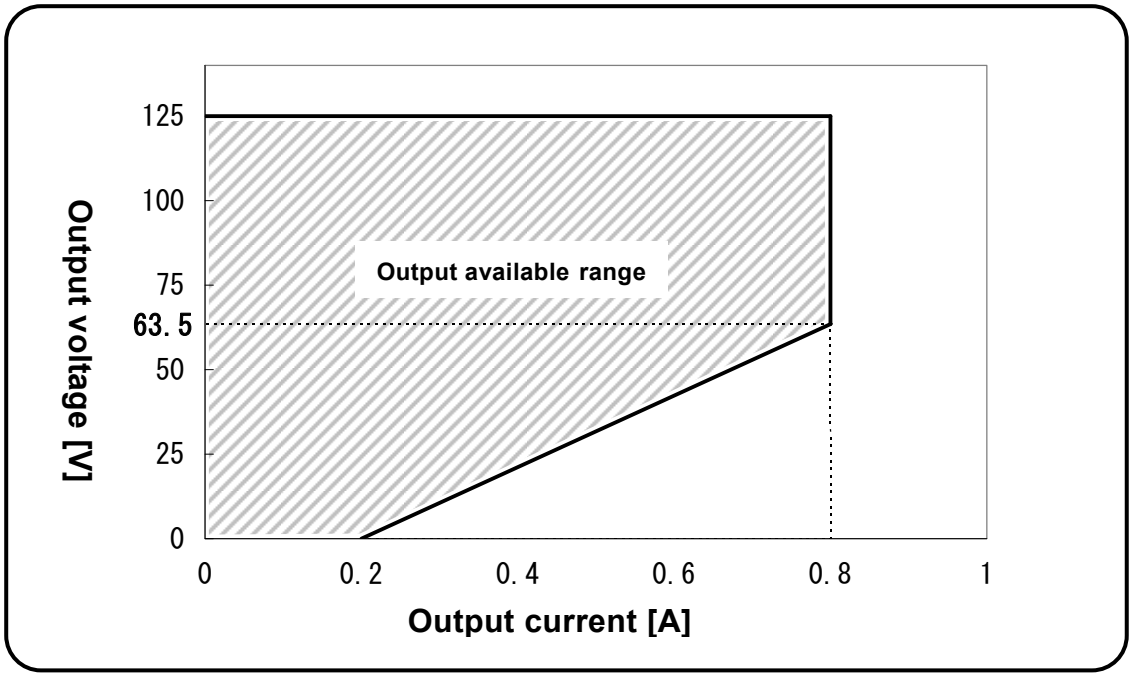


Figure 9-1 Output voltage characteristics in the 125V range of voltage output

9.1.2 DC output

		Voltage output three phases		
Rated output range		40V	125V	250V
DC output voltage range	DC+ setting	0 to +40V	0 to +125V	0 to +250V
	DC-setting	0 to -40V	0 to -125V	0 to -250V
DC output current range	DC+ setting	0 to +0.1A		
	DC- setting	0 to -0.1A		
Rated load Note 1		400Ω	1250Ω	2500Ω
Amplitude accuracy		Within ±1.0% of each range full scale (±0.5% typ.)		
DC offset		Within ±0.5% of each range full scale		
Set resolution		10mV	0.1V	0.1V
Load regulation		Within ±0.5% (with rated output amplitude・load variation 100%)		
Line regulation		Within ±0.1% (with rated output amplitude・power variation ±10%)		

- The rating above applies when the ambient temperature is +15 to +35℃ and the ambient humidity is 5 to 85%RH.
- The output voltage is specified by the output terminal. The phase is specified by a relative value at each output.
- Quick changes and sweeps are only possible within the same range.

Note 1: The rated voltage output load has the minimum available resistance at the maximum voltage output.

9.2 Signal generator

■ Number of output

3 channels: voltage out

■ Frequency mode

50Hz fixed, 60Hz fixed and internal (variable frequency)

Accuracy within ±30ppm

Internal variable range 10.000 to 200.000Hz, 1mHz of resolution

External synchronization and line synchronization

External synchronization frequency range 45 to 65Hz

Synchronization settling time within 1s

9.3 Operation mode

The RX4718W has the following operation modes to facilitate performing various tests.

■ Manual mode

Allows a normal/fault state to be output freely according to the panel setting without affecting the operations of a start signal or trip signal. The built-in timer does not operate.

The level of a trip input can be monitored from the LED on the front panel, making it possible to operate frequencies, amplitudes, phases and waveforms while checking the relay operation.

■ Hold (HLD) quick change mode

This is a fault mode simulating the permanent fault. When the trip input operates, the amplifier output returns to normal and remains unchanged if the trip input changes afterwards.

It quickly changes normal/fault states for each of elements such as frequency, amplitude, phase and waveform and measures the relay operation/recovery time using the built-in timer through changes of a trip input.

Elements whose normal value matches the fault value are not quickly changed.

The following quick change control function is available in this mode.

Fault start phase 0 to 359.9°, resolution of 0.1° and function off

Quickly changes to fault when the setting phase is generated by quick change start command.

Pre-trigger time 10 to 6000ms, resolution of 1ms and function off

Quickly changes to fault when the setting time elapses after the quick change start command is given.

Fault duration 0.001 to 65.000s, resolution of 1ms and function off

If a trip input does not change within a set time, it is forcibly returned to a normal state.

■ Non-hold (NHD) quick change mode

This is a fault mode simulating the arc fault. The first trip input makes the amplifier output normal and when the trip input recovers, the amplifier output becomes fault, then quickly changes by the trip signal.

It quickly changes normal/fault states for each of elements such as frequency, amplitude, phase and waveform and measures the relay operation/recovery time using the built-in timer through changes of a trip input.

When the normal command is received, the output becomes normal and the test ends. The amplifier output remains normal even if the trip signal changes.

Elements whose normal value matches the fault value are not quickly changed.

The quick change control function is available in this mode as in the hold quick change mode.

■ Simultaneous operation/recovery measurement mode

In this mode, operation time and recovery time are measured simultaneously by one quick change.

Fault waiting time 0.01 - 9.99s, resolution of 10ms

This sets the time until the output recovers to a normal state after the operation time is measured.

■ Normal sweep

This performs a sweep between normal and fault values for each of elements such as frequency, amplitude and phase. No sweep is applicable for elements whose normal value and fault value are the same. There are two types of sweep: manual sweep and automatic sweep.
Automatic sweep automatically stops the sweep through a change of the trip input and allows measurement of the operation value and recovery value of the protective relay from the panel display at that time. During a fault direction sweep, the sweep is stopped through trip input operation and during a normal direction sweep, the sweep is stopped through recovery of the trip input.
Manual sweep needs input of the sweep position using keys such as MODIFY. The trip input state has no effects on the sweep.

Mode	3 types of linear sweep, 1LG sweep (1-wire ground fault), 2LS sweep (2-wire short-circuit)
Sweep operation	2-direction sweep from normal to fault and from fault to normal.
Manual sweep	ON/OFF (When this is turned off, automatic sweep is on.)
Sweep time	1.0 - 1000.0s, resolution of 0.1s

■ Search sweep

This mode repeats sweeps between a normal value and fault value while slowing down the speed to measure more accurate operation time.
No sweep is applicable for elements whose normal value and fault value are the same.

Mode	3 types of linear sweep, 1LG sweep (1-wire ground fault), 2LS sweep (2-wire short-circuit)	
Sweep operation	sweeps for detecting the operating value and for detecting the recovery value.	
Judge time	0.1s to 10.0s	(Also used for DSK search sweep)
	Setting of the time required for judging that the trip input change is determined.	
Number of sweeps	1 to 10 times	(Also used for DSK search sweep)
	Setting of the number of sweeps repeated	
Output cut	on/off	(Also used for DSK search sweep)
	Setting of turning the output on (used) or off (unused) after measurement	

■ DSK search sweep

Operates a disk type protective relay with slow operation first, then carries out a search sweep and measures more accurate operating values and recovery values in a short time.
No sweep is applicable for elements whose normal value and fault value are the same.

Mode	3 types of linear sweep, 1LG sweep (1-wire ground fault), 2LS sweep (2-wire short-circuit)	
Sweep operation	sweeps for detecting the operating value and for detecting the recovery value.	
Judge time	0.1s to 10.0s	(Also used for search sweep)
	Setting of the time required for judging that the trip input change is determined.	
Number of sweeps	1 to 10 times	(Also used for search sweep)
	Setting of the number of sweeps repeated	
Output cut	on/off	(Also used for search sweep)

Setting of turning the output on (used) or off (unused) after measurement

Trip waiting time 0.1 to 10.0s

Setting of the waiting time from the quick change caused by the operation start to change of the trip.

■ Frequency sweep mode

This is a dedicated frequency relay measurement mode. It measures operation frequency, operation time, recovery frequency and recovery time with a single sweep.

Sweep speed 0.001 to 9.999Hz/s, resolution of 1mHz/s

Setting of the frequency sweep speed

Crossover frequency 10.000 to 200.000Hz, resolution of 1mHz

Setting of the crossover frequency to measure the operation/recovery time.

Frequency hold time 0.01 to 650.00s, resolution of 0.01s

Setting of the holding time until the frequency sweep starts in the direction from the normal to fault.

Amplitude quick change ON/OFF

Setting whether to have quick change of the output amplitude and phase (on/off) when the measurement starts.

9.4 Timer

This timer is used for a quick change operation. Connecting a trip signal from the protective relay allows measurement of operation time (dynamic characteristic) of the protective relay.

■ Timer mode

Interval	Measures the time from the start of a quick change to the first trip input operation point.
One-shot	Measures the time of operation width of the first trip input operation.
Train	Measures the total time of operation width of the trip input.
Start measurement	Measures the time from the operation start input to the trip input

■ Measurement range

3 ranges of 0 to 9999.9ms, 10.000 to 99.999s and 100.00s to 999.99s

Automatic range switching

■ Measurement accuracy

Within ± (0.01%+1 digit)

■ Timer setting

Timer clear

Automatic	Automatic clear of the timer value when quick change operates.
Manual	Clear of the timer value by clear key operation.

Automatic recovery

ON	recovers to normal with the trip input operation in the hold quick change mode.
OFF	does not recover to normal and remains fault with the trip input operation in the hold quick change mode.

9.5 Output selector

Switch the voltage output to the front terminal or side terminal.

The side terminal is 2-system (1L/2L) 3-phase 4-wire output, and ground fault and short circuit (line to line) of 3-phase or 1-phase can be selected.

For 3-phase, the voltage 1 to 3 are connected to the 3-phase 4-wire connector and 1L or 2L output is selected. Phase selection of R, S and T switches the output value of the voltage output 1 to 3 to the adjacent phase.

For 1-phase, the voltage output 1 outputs 1L and the voltage output 3 outputs 2L but the voltage output 2 does not output. Phase selection of R, S and T allows selecting one interphase or line.

■ Setting of output selector

Front terminal All three phases are output to the front terminal.

Side terminal 3-phase

Connect voltage 1 to 3 to a 3-phase 4-wire cable and select 1L or 2L output.

Selection from R to S, S to T, T to R: voltage output 1→2, 2→3, 3→1

Selection from R to T, S to R, T to S: voltage output 1→3, 2→1, 3→2

Side terminal single-phase

Voltage output 1 output to 1L and voltage 3 to 2L but voltage 2 does not output.

Ground fault selects between R and N, S and N or T and N by phase selection.

Short circuit selects between R and S, S and T or T and R by phase selection.

■ Voltage output 1L, 2L (side terminal)

Output format floating, withstand voltage between chassisesAC500Vrms 1min,
SNS type metal connector with 6 pins (manufactured by Sanwa Denki Kogyo Co., Ltd.)

Pin connection ①-R, ③-S, ⑤-T, ②-N

9.6 Master/slave

It is possible to connect 2 to 4 RX4718W units and use them as a multi-phase protective relay tester by making daisy-chain connections of accessory parallel control cables one by one to the parallel control signal connectors.
Through operations of the master unit only, it is possible, to synchronize frequencies with the master unit, make phase setting between the units possible and perform simultaneous operations of quick changes and sweeps.

■ Master/slave setting

Master	RX4718W becomes a master unit.
Separate	RX4718W is used as a single unit.
Slave	RX4718W becomes a slave unit.

■ Selector communication function ON/OFF

This function turns the synchronization of R, S, ant T states on/off between the devices equipped with the output selector of this series when the master/slave operation is on.

■ Trip phase selection function

This function is available when this series 4741 is the following version.

Japanese version	1.32, 1.34, 1.42
English version	1.33, 1.35, 1.43

When 4741 is a master device, total test mode, and line PD, the trip phase of RX4718W (the amplitude is 0) is set if the fault sequence is trip.
Three phases (all phases), R (V1), S (V2), T (V3), R-S (V1 and V2), S-T (V2 and V3), T-R (V3 and V1)

■ Parallel control signal

This is a connector to make daisy-chain connections of supplied parallel control cables in the master/slave function.

Format	chassis potential in the common side, 36-pin multi-connector

9.7 Amplifier input selection

This function drives the amplifier of RX4718W with external signals using the external signal input/output and drives the external booster using the internal synthesizer signal of RX4718W.

■ Setting of input selection

Internal

The amplifier output signal is an internal synthesizer signal.

External output

The external signal output drives the external booster. The output amplitude of the external booster is set as follows.

Voltage output setting range: 0.0 to 999.99V

■ External signal output

This is a synthesizer output inside the RX4718W and used to drive the external amplifier.

Number of output phases	3 phases of voltage three phases
Output format	Unbalanced, common side: chassis potential, BND receptacle.
Output voltage	1Vrms (when rated value is set for each range)
Output phase	In phase to voltage output terminal
Output impedance	10Ω or less

9.8 Other functions

■ Amplifier output on/off control

On/off for each phase, on/off for all phases (ON is enabled/disabled by the internal dip switch.)

■ PSW mode (setting of the fault command key operation on the front panel.)

Alternate (fault is retained once pressed), momentary (fault when pressed, normal when released)

■ Phase setting minus on/off

■ Interlock 3ϕ

This allows changing the set values of three phases (amplitude or phase) simultaneously.

■ Balanced 3ϕ

This allows setting of balanced 3-phase state with the output where the cursor is placed as a reference.

■ 1LG setting

This sets up 1LG (1-wire ground fault in the resistance ground system) fault setting. Setting the zero phase voltage at fault calculates each voltage set value for 1LG fault setting and completes the setting automatically.

Ground fault phase selection V1, V2, V3

Zero phase voltage 0.000～999.99V

■ 2LS setting

This sets up 2LS (2-wire short circuit) fault setting. Setting the line to line voltage at fault calculates each voltage set value for 2LS fault setting and completes the setting automatically.

Short-circuit phase selection V1-V2, V2-V3, V3-V1

Line to line voltage 0.000～1732.0V

■ Line to line voltage calculation

Setting of 3-phase amplitude and phase calculates the normal/fault zero phase voltage and line to line voltage.

■ Phase rotation

This rotates the value of voltage output 1 to 3 from V1, V2 to V3 and from V3, V2 and V1.

■ Beep setting on/off

■ Panel setting memory

Read, write, comment input, 50Hz/60Hz initial value read, all memory clear.

■ Internal dip switch setting

Description	Setting detail: *indicates the factory setting.
When RX4718W is a master, all output ON is sent to the slave.	ON(disable)/*OFF(enable)
All output ON of RX4718W	ON(disable)/*OFF(enable)
Wave select +DC/-DC function	*ON(disable)/OFF(enable)
When the external signal output is off, the signal amplitude is 0.	*ON(disable)/OFF(enable)

9.9 Various input/output

■ Operation start input

This is the input signal to start a quick-change or sweep operation by an external signal. It has the input logic setting and stop setting function.

When the stop setting is turned on, the quick-change or sweep operation can be stopped by removing the signal.

Input format	voltage and contact, binding post	
Voltage input	floating, withstand voltage between chassises AC250Vrms 1 min	
Voltage input range	0 to +130V	
Input impedance	20kΩ	
Threshold voltage	High level: +2.5V Low level: +1.0V	
Contact input	floating, withstand voltage between chassises AC250Vrms 1 min	
Open voltage	+5V	
Short-circuit current	10mA	
Logic setting	apply a、remove b	
Stop setting	ON/OFF	

■ Trip input

This is the operation-signal-input terminal of the protective relay. This is used to control the timer and normal/fault and to automatically stop the sweep operation. It has the input logic setting and chattering correction function.

Input format	voltage and contact, binding post
Voltage input	floating, withstand voltage between chassises AC250Vrms 1 min
Voltage input range	0 to +130V
Input impedance	20kΩ
Threshold voltage of +2.5V terminal	High level: +2.5V Low level: +1.0V
Threshold voltage of +8V terminal	High level: +8.0V Low level: +5.0V
Threshold voltage of +50V terminal	High level: +50.0V Low level: +40.0V
Contact input	floating, withstand voltage between chassises AC250Vrms 1 min
Open voltage	+5V
Short-circuit current	10mA
Logic setting	apply a、remove b
Chattering correction time	1 to 100ms, resolution of 1ms and function off

■ Quick change command input

This is the external signal input to directly control the output of the RX4718W from a normal to fault state. When High, it is in a normal state and when Low, a fault state.

It is mainly used to perform simultaneous quick-change control in combination with out 4705A and to control the RX4718W by a command of the 4705A (REMOTE OUTPUT).

Input format	logic signal, chassis potential: common side, binding post
Voltage input range	0 to +130V
Input impedance	10k Ω
Threshold voltage	High level: +2.5V Low level: +1.0V

■ Quick change command delay output

This is the signal that changes when the output of the RX4718W quickly changes. When the RX4718W is in a fault state, it becomes Low.

It is mainly used to perform simultaneous quick-change control in combination with out 4705A and to control the RX4718W by a command of the 4705A (REMOTE INPUT).

Output format	logic signal, chassis potential: common side, binding post
Voltage output range	0 to +5V

■ Quick change command direct output

This is the signal that changes when the RX4718W start operating. It is Low when the RX4718W is in operation.

It is mainly used to perform simultaneous quick-change control in combination with out 4705A and to control the RX4718W by a command of the 4705A (REMOTE INPUT).

Output format	logic signal, chassis potential: common side, binding post
Voltage output range	0 to +5V

■ Pre-trigger output

This is the signal to start the oscillator.

When the RX4718W starts operation, the voltage output becomes Low and the contact output becomes short-circuit. It recovers in approx. 0.1 sec after the quick change command direct output recovers.

Output format	Voltage and contact, binding post
Voltage output	Chassis potential: common side
Voltage output range	0 to +5V
Contact output	floating, withstand voltage between chassises AC250Vrms 1 min
Contact capacity	AC30V/0.1A, DC30V/0.2A

■ Frequency synchronization signal output

This is the output signal synchronized with the output frequency of the RX4718W. The falling edge of the signal is phase 0 degrees.

Mainly used connected with our 4705A(SYNC INPUT).

Output format	logic signal, chassis potential: common side, binding post
Voltage output range	0 to +5V

■ Expanded external response input

This is a connector connected to the expanded response input box (optional) to expand the trip input up to 255 channels.

Output format	50-pin multi-connector
Signal format	response signal input: floating, withstand voltage between chassises AC250Vrms 1 min, control output for signal selection: chassis potential
Selected address	0 to 255
Simultaneous selection disabling signal	1 bit
Power supply output	+24V, 100mA

9.10 Interface

9.10.1 GPIB

The GPIB cannot be used simultaneously with the RS-232C.

■ Setting items

All front panel settings except power switch, GPIB address and RS-232C parameters
Arbitrary waveform data

■ Code used

ISO 8-bit codes, alphabet upper/lower case-insensitive

■ SRQ factors

Output overload, timer measurement end, sweep end, error generation

■ SRQ mask

Individually maskable

■ Interface function

SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT0, C0

9.10.2 RS-232C

The RS-232C cannot be used simultaneously with the GPIB.

■ Setting items

All front panel settings except power switch, GPIB address and RS-232C parameters
Arbitrary waveform data

■ Baud rate

Switching of 6 points; 300, 600, 1.2k, 2.4k, 4.8k and 9.6k

■ Data bit length

8 bits

■ Stop bit length

1 bit or 2 bits

■ Parity

NONE, EVEN or ODD

9.11 General

■ Power supply

48Hz-62Hz AC85V-115V, AC180V-240V

■ Maximum power consumption

800VA

■ Withstand voltage

Between total power input and chassis	AC 1500V, one minute
Between total voltage output and chassis	AC 500V, one minute
Between total current output and chassis	AC 500V, one minute
Between trip input and chassis	AC 250V, one minute
Between operation start input and chassis	AC 250V, one minute
Between pre-trigger contact output and chassis	AC 250V, one minute
Between control power output and chassis	AC 250V, one minute

■ Performance guarantee temperature and humidity

+15 to +35℃, 5 to 85%RH No condensation

■ Operation guarantee temperature and humidity

0 to +40℃, 5 to 85%RH No condensation

■ Storage temperature and humidity

-10 to +50℃, 5 to 95%RH No condensation

■ External dimensions

430(W)×249(H)×469(D)mm not including protrusions

☞「Figure 9-2 External dimensions」

■ Weight

19kg

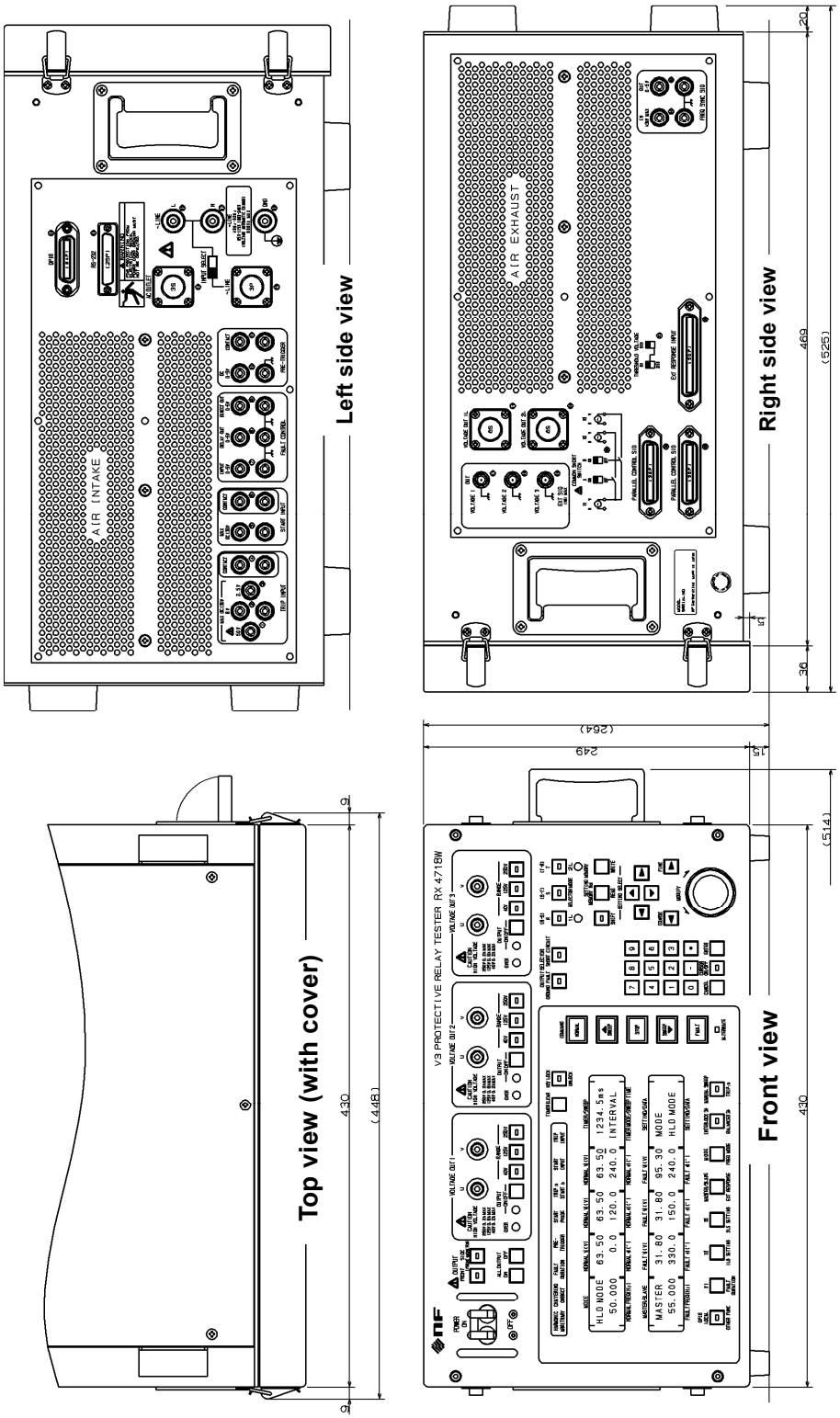


Figure 9-2 External dimensions

WARRANTY

NF Corporation certifies that this instrument 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 of, **NF** will, at its option, either will repair the defective product without any charge for the parts and labor, or either repair or replace products which prove to be defective. For repair service under warranty, the product must be returned to a service center designated by **NF**. Purchaser shall prepay all shipping cost, duties, and taxes for the product to **NF** from another country, and **NF** shall pay shipping charge to return the product to purchaser.

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

NF Corporation

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

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RX4718W Protective Relay Tester Instruction Manual

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