

# MITSUBISHI

World  
Super AE

MITSUBISHI Low-Voltage Air Circuit Breakers series  
World Super AE

## Field test device Y-2000 for AE-SW series

# INSTRUCTION MANUAL

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Before using this device, please read this instruction manual.



## OBSERVE THE FOLLOWING FOR SAFETY:



- Before using this device, make sure to read this Instruction manual thoroughly. The cautionary items noted herein are of the utmost importance for the safe use of this device, and should always be strictly followed.
- Store this instruction manual together with the device so that it can be read anytime during use.
- Also read the instruction manual for AE-SW to be tested, and take care not to damage the air circuit breaker.
- These safety precautions and Instruction manual is prepared for an electrical expert.


The following symbols have been used:


 <b>DANGER</b>	Failure to follow these instructions may result in dangerous conditions, which in turn could lead to severe personal injury or even death.
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 <b>CAUTION</b>	Failure to follow these instructions may result in dangerous conditions, which could result in moderate to slight personal injury or damage to equipment and facilities
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	Warning for possible electrification under certain conditions.
	Warning for possible outbreak of a fire under certain conditions.

	This means prohibition. Never ignore this indication.
	Be sure to follow these instructions without fail.

 <b>DANGER</b>
<ul style="list-style-type: none"> <li>● Do not use this device on the conditions over ratings. Otherwise ground-fault, short circuit fault or fire may occur due to dielectric breakdown.</li> <li>● Do not touch the terminals of Breaker and Y-2000. There is a risk of electrical shock.</li> </ul>

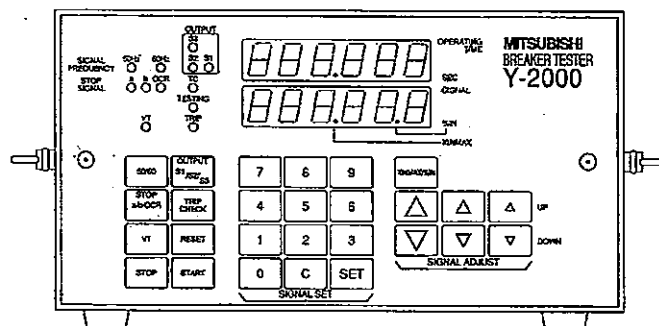
 <b>CAUTION</b>
<ul style="list-style-type: none"> <li>● Test should be performed by an electrical expert.</li> <li>● Test should be performed only after shutting off the electric power and verifying that there is no voltage present. Failure to do so may result in an electrical shock.</li> <li>● Connect for tests in accordance with the description given in this instruction manual. Otherwise, electric shocks or malfunction may occur.</li> <li>● Do not install in areas subject to high temperatures, high humidity, dust, corrosive gas, vibrations, shocks, etc. To do so may result in malfunction or fire.</li> <li>● This tester is for 100-240VAC 50/60Hz. Using it at other specifications may cause fires or malfunction.</li> <li>● After testing, remove the wiring used for testing and restore the circuit breaker to its original condition. Any other conditions may cause fires or malfunction.</li> <li>● When discard products, dispose of as industrial waste.</li> </ul>

# 1. Specification

The Y-2000 breaker tester is a light-weight portable tester for MITSUBISHI Low-Voltage Air Circuit Breakers series.

The characteristics of electronic trip relay (ETR) can be checked in the field without applying the current to circuit breaker.

This tester can be used for both AE-SS and AE-SW series. Especially this instructions manual describes AE-SW series.



Input voltage	100-240V AC 50/60Hz (available voltage range: AC85-264V)
Power consumption VA	100VA or less
Range of signal output	Voltage signal equivalent to 1%~2500% of CT rating (I <sub>n</sub> ) (continuously adjustable). *The output at 100% of CT rating is 141mV at 50Hz or 170mV at 60Hz.
Test power output and trip check power output	DC30V 5W
Terminal for checking the signal output	The same signal as the signal output is output to the terminal on the back side (load impedance: 100kΩ or more).
Stop signal input	"a" contact, "b" contact or test terminal (OCR)
Test items	LTD, STD, INST/MGR, GFR, PAL, PAL2 and Trip check *ER check is not available.
Signal level	Max. 2500% of Rated current setting (I <sub>r</sub> ) (accuracy: ±2.5% at CT rating)
Time counter	0.000s±2ms~999.999s±1%
Working temperature range	0~40°C (humidity: 85%Rh or less)
Storage temperature range	-10°C~50°C(humidity: 85%Rh or less)
Dimensions	230mm (W) X 120mm (H) X 290mm (D) (excluding protruding portions)
Weight	5kg
Attachments	AC power cord, test cable



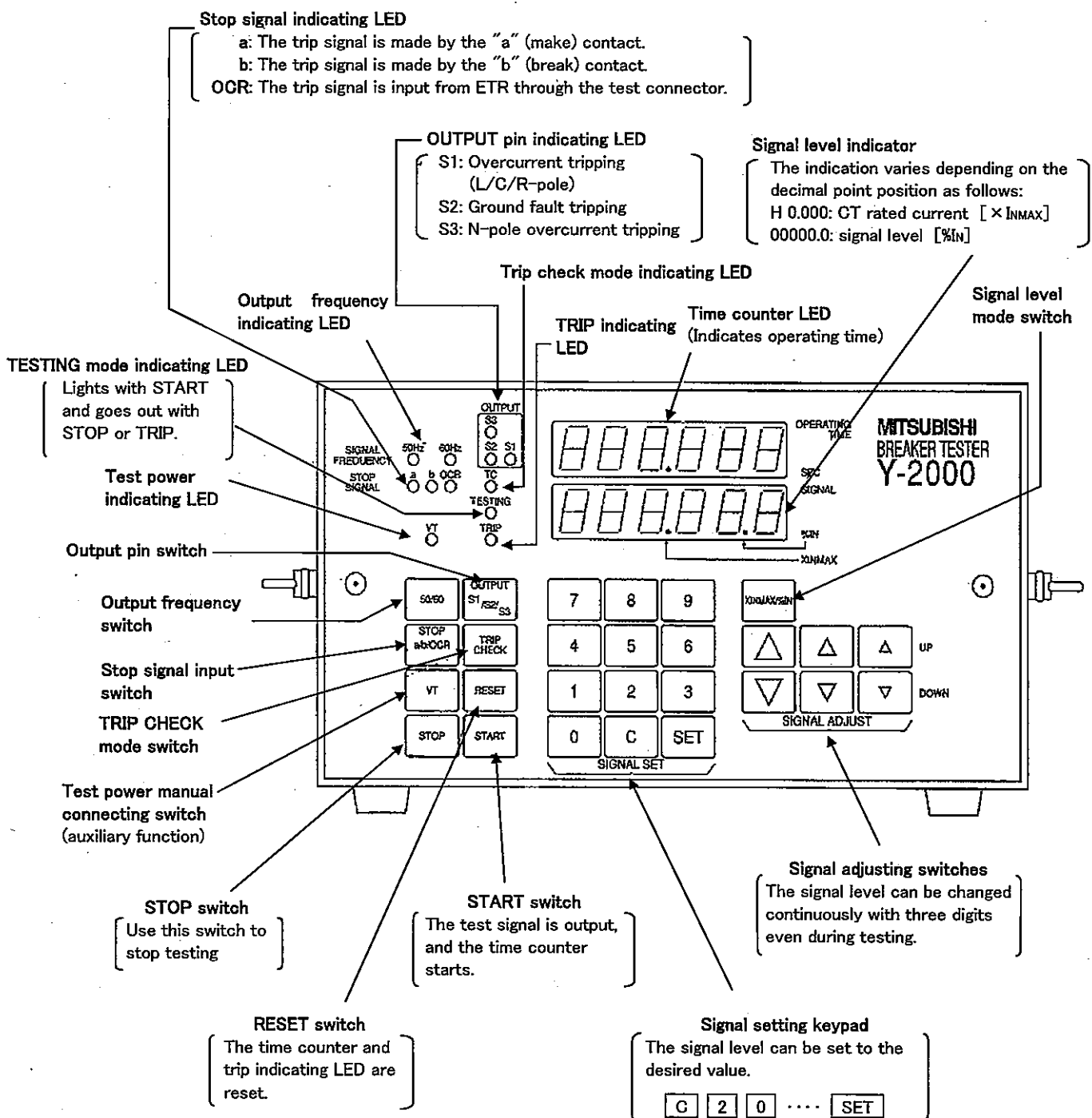
Earth leakage protection (ER) check is not available with this tester. Please make a reference separately about the ER operating check method.

## 2. Part names and functions





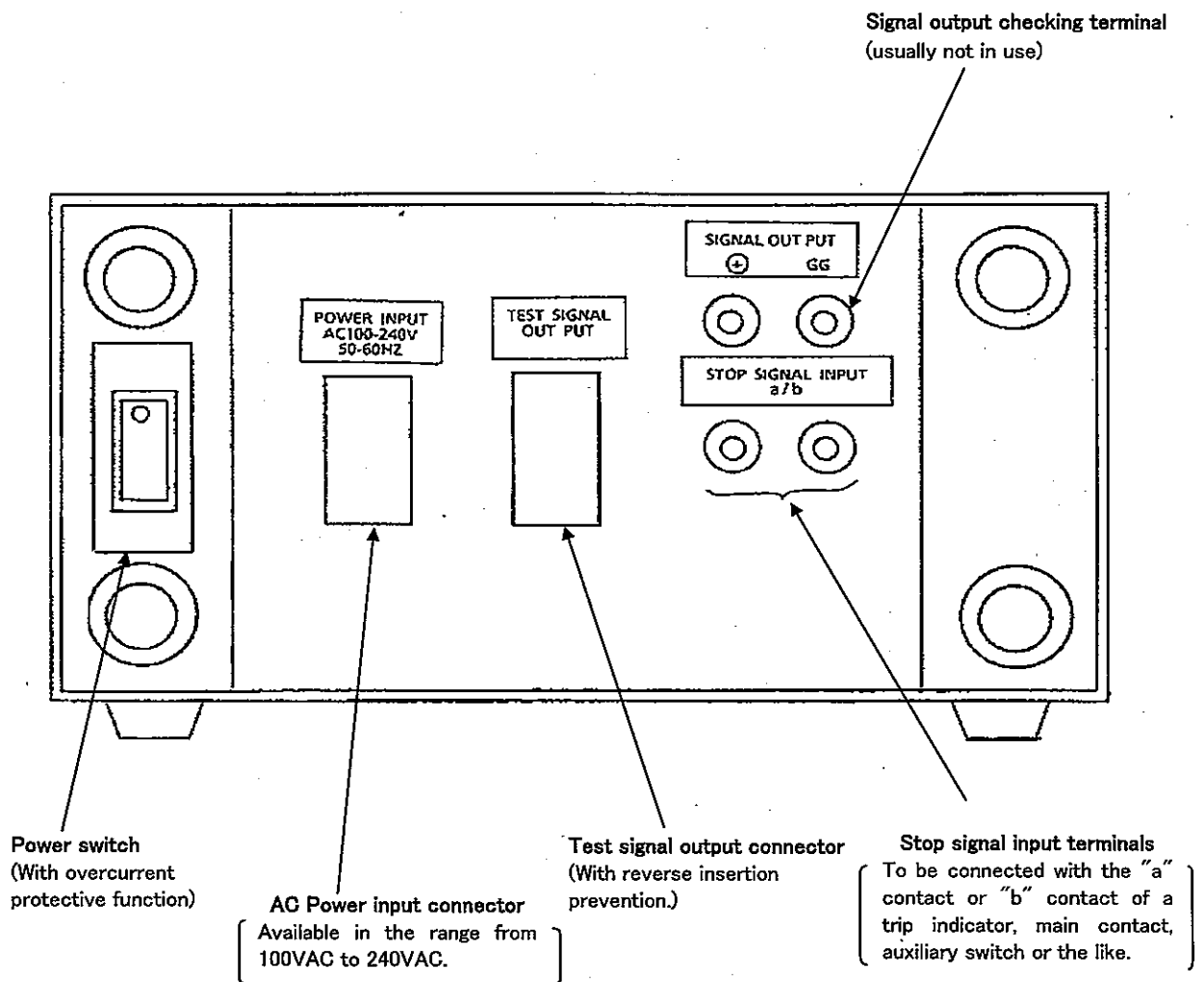
The abbreviated name INMAX and IN indicated on the front face of Y-2000 correspond to In and Ir of AE-SW electronic trip relay (ETR), respectively. Be careful in testing or operating.


### ● Front view





● Back view

	For calibration, inquire at any of our branch offices or service centers.
	The test signal output can be checked by connecting an AC voltmeter.



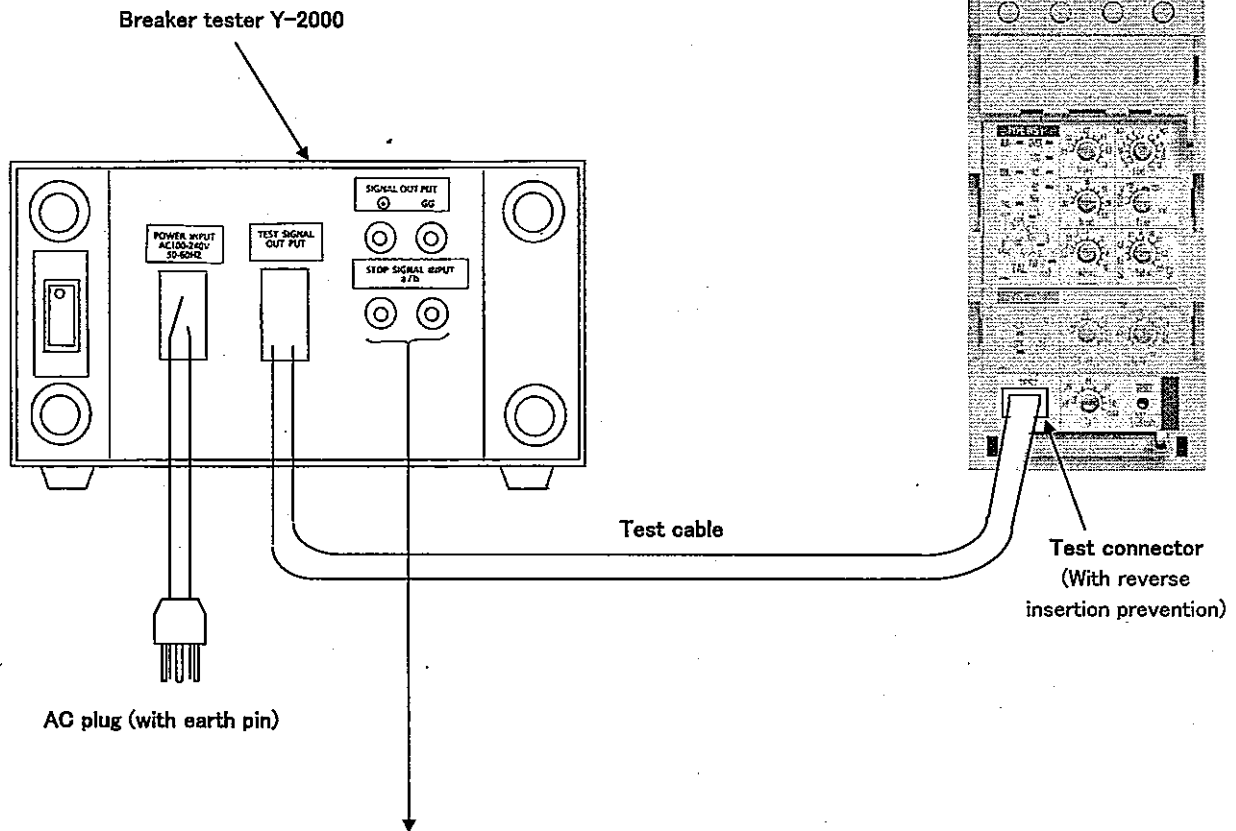
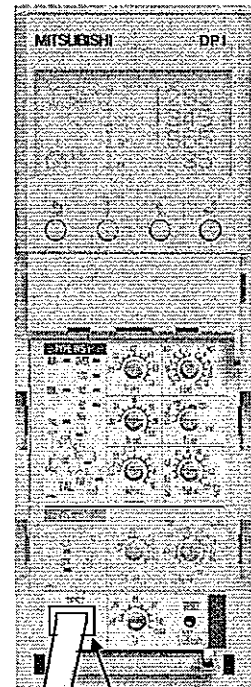
 <b>DANGER</b>	When using the "Stop signal input terminals", check that no power is supplied and that there is no interference with other wiring in the panelboard. Otherwise, electric shocks or short circuits may occur.
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### 3. Connection

 <b>DANGER</b>	Do not touch the terminals. Otherwise, electric shocks may occur.
	When checking a dielectric voltage test or insulation resistance measurement of the circuit breaker and panelboard, remove all wiring for Y-2000. Otherwise, trouble may occur.

#### Electronic trip relay (ETR)

Note) This figure includes Display (\*option)  
and MCR switch (\*option).



These are used when the stop signal is input from other than the test cable (test connector of ETR).

- ① When using the main contact of breaker. ... Set the "Stop signal input switch" on the front face to [b].
- ② When using the "a" contact of auxiliary switch (AX). ... Set the "Stop signal input switch" to [b].
- ③ When using the "b" contact of auxiliary switch (AX). ... Set the "Stop signal input switch" to [a].
- ④ When using the OCR alarm switch (AL). ... Set the "Stop signal input switch" to [a].  
 \*Connect to the circuit breaker's control circuit terminal block ( [ 97 ] and [ 98 ] ).
- ⑤ When using the alarm contacts. ... Set the "Stop signal input switch" to [a].  
 \*Connect to the circuit breaker's control circuit terminal block ( [ 513 ] and [ 524 ] ~ [ 564 ] ).  
 \*For using these alarm contacts, the Power supply module with alarm contact (type: P3, P4 OR P5) is required.

## 4. Initial setting and operation



Start the setting and operation after carefully reading an instruction manual for AE-SW (IB63332/IB63366) and 6. *Settings and accuracy* in this instruction manual to understand the characteristics of ETR.

### 4.1 Setting of rated current

- (1) Pull the two black knobs on the front cover of ETR, and remove the front cover.
- (2) Connect a test cable to ETR as described in *Chapter 3*.
- (3) Turn on the "Power switch" on the back panel.
- (4) Set a mode with the corresponding switches described below. The settings are changed in turn by pushing the switches. As for function of each setting, see *chapter 2*.

• Output frequency	<input type="checkbox"/> 50Hz / <input type="checkbox"/> 60Hz
• Stop signal	<input type="checkbox"/> a / <input type="checkbox"/> b / <input type="checkbox"/> OCR
• Output pin	<input type="checkbox"/> S1 / <input type="checkbox"/> S2 / <input type="checkbox"/> S3
• Test mode	<input type="checkbox"/> usual test / <input type="checkbox"/> TRIP CHECK

\*When power is turned on, each item is set to the  marked position.

#### (5) Setting of Rated current

This tester outputs a signal at the rate of  $I_r$  (rated current) of ETR. Therefore, at the beginning,  $I_r$  should be set in % of  $I_n$  (CT rated value).

① Set a mode to  with "Signal level mode switch  × INMAX /  %IN".

(When power is turned on, the rated current is set to ).

② Input a value of the rated current to  with "Signal adjusting switches" or "Signal setting keypad".

● When testing the Overcurrent tripping or pre-alarm characteristics.

(i) In case of WS or WB type relay;

Input a value of  $I_r$  setting dial of ETR.

Example) In case that  $I_r$  is set to 0.8: Input .

(ii) In case of WM type relay;

Input a value calculated by  $(I_r [A] \div I_n [A])$ .

Example) In case that  $I_n=1600A$  and  $I_r=1283A$ :  $1283A \div 1600A=0.802$ , therefore input .

● When testing the ground fault characteristics.

Set to  even if  $I_r$  setting dial of ETR is not set to 1.0.

## 4.2 How to operate

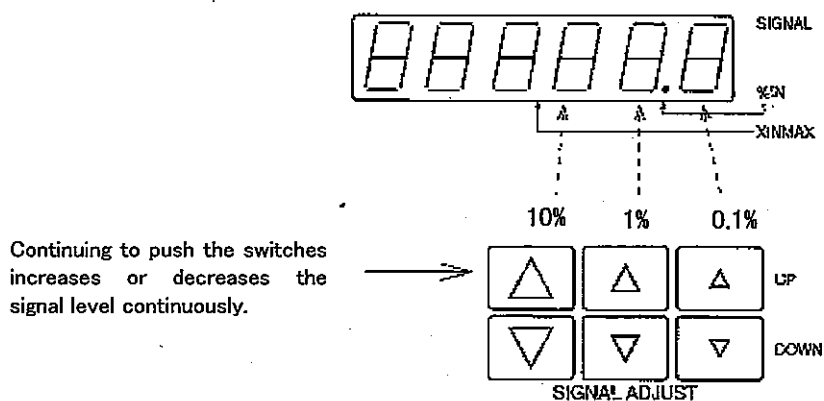


When current is flowing in the main circuit of breaker, it is combined with the test signal of Y-2000, consequently does not become correct characteristic. The operating test should be performed in the state that load current does not flow in the main circuit.

(1) Set the "Signal level indicator" to  by pushing the "Signal level mode switch" .

(2) Set a signal level in % of Ir by using the "Signal adjusting switches" or "Signal setting keypad".

● When using the "Signal adjusting switches":



● When using the "Signal setting keypad":

- ① Push a clear key .
- ② Since figures are shifted to left every time you push numerical keys, enter the desired values.
- ③ Push a set key .

To set to 200%Ir, push      , and  is set.

(3) Push  switch, and the test signal is output. Then the time counter starts from , and also the "TESTING mode indicating LED" lights.

(4) Push  switch, and the test signal is stopped. Then the time counter stops, and the "TESTING mode indicating LED" goes off.

In case of tripping, the "TRIP indicating LED" lights and the time counter stops automatically.

(5) Push  switch to reset the "TRIP indicating LED" and the time counter. This switch is used for retesting.



## 5. Test



It is possible to display a trip current value on LCD by supplying control power to ETR, if Display (DP1 or DP2) (\*option) is equipped. However, this value may become somewhat larger than the value displayed by Y-2000, especially in case of STD and INST trip. Furthermore, since the test signal from Y-2000 is not input into the Extension module (EX1), even if it supplies the test current to ETR, the measuring current value displayed on LCD will be as "0".

### 5.1 LTD Pick-up current test

(1) Set the signal level to approximately 90% of LTD pick-up current.

(2) Push **START** switch.

(3) Increase the signal level with "Signal adjusting switch", and take a reading of pick-up value.

(i) In case of WS type relay

The pick-up value is calculated by;

(Pick-up level at a point where ETR turns a [OVER] LED on) ÷ I<sub>u</sub>.

Example) When the [OVER] LED lights at 94% with I<sub>u</sub>=0.8, the pick-up value is 94% ÷ 0.8=117.5%.

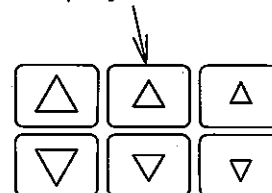
(ii) In case of WM type relay

The LTD pick-up level can be taken at a point where ETR turns a [100%] LED on.

(4) Push **STOP** switch.

(5) Push **RESET** switch and start at (1), if testing again.

Increase the signal level with this 1% step key.



Signal adjusting switches

### 5.2 LTD operating time test

(1) Set a desired signal level.

(i) In case of WS type relay

The operating time is to be taken at 200%I<sub>u</sub>, therefore, if I<sub>u</sub> is set to 1.0, set the signal level to **00200.0**.

In case that I<sub>u</sub> is not set to 1.0, for example, if I<sub>u</sub> is 0.9, since 0.9 × 200%=180%, set the signal level to **00180.0**.

(ii) In case of WM type relay

The operating time is to be taken at 200%I<sub>L</sub>, therefore, if I<sub>L</sub> is set to 1.05, since 1.05 × 120%=126%,

set the signal level to **00126.0**.

(2) The I<sub>sd</sub> (short-time-delay pick-up current) and I<sub>i</sub> (instantaneous pick-up current) setting dial of ETR should be set to 1.2 times or more the above-mentioned signal level.

(3) Push **START** switch.

(4) After tripping, the operating time is indicated.

(5) Push **RESET** switch and start at (3), if testing again.



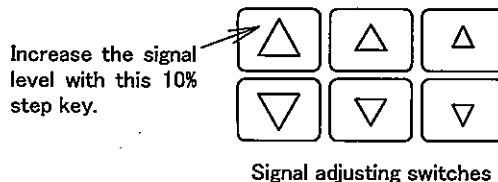
Since ETR has a memory effect for overcurrent state, when the operating time test is interrupted on the way, the operating time at the next test becomes short. This memory effect can be reset by tripping. Therefore, if operating time test is interrupted on the way, perform the next test after tripping ETR one-time. To trip, perform the trip check in accordance with 5.12.

<Hint> In section 5.1 and 5.2, if I<sub>u</sub> of WS type relay is not set to 1.0, the reading value of the signal level can be regarded as the LTD pick-up current (%) by setting the value of **H 0.000** to I<sub>r</sub> × I<sub>u</sub>. Also, when measuring the LTD operating time, test can be performed with the signal level **00200.0**. However, when checking the STD or INST characteristics, return the setting of **H 0.000** to a former value.

### 5.3 STD Pick-up current test

(1) Set Ii (instantaneous pick-up current) setting dial of ETR to the maximum, and set Tsd (short-time-delay operating time) to the minimum (0.06s).

\* If the setting value of Tg is large, exact measurement cannot be performed in the following (5).



(2) Set the signal level to approximately 80% of Isd.

(3) Push **START** switch, and immediately increase the signal level with a 10% signal adjusting switch, then release the switch as soon as ETR trips.

	<p>Increase the signal level by using 10% step key. Since it takes a long time to test in case of 1% or 0.1% step, the LTD pick-up may operate before STD. If LTD pick-up operates even the 10% step, start again at approximately 95% of Isd.</p>
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(4) Read the signal level indicated at the time.

(5) Furthermore, measure the operating time near the pick-up current measured in (3) by using 1% step key. The point where the operating time becomes short suddenly serves as accurate measured value of Isd.

(6) Push **RESET** switch and start at (2), if testing again.

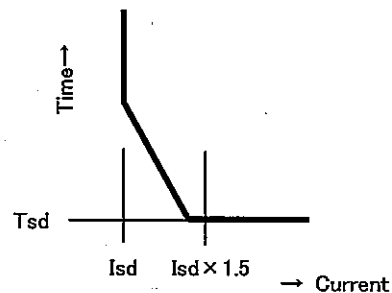
### 5.4 STD operating time test

(1) Set Ii setting dial of ETR to the maximum.

(2) Set a desired signal level.

For example, if Isd setting dial is set to 4, since  $400\% \times 1.5 = 600\%$ , set the signal level to **00600.0**.

\*Where, 1.5 is a value that the operating time becomes flat.



(3) Push **START** switch.

(4) After tripping, the operating time is indicated.

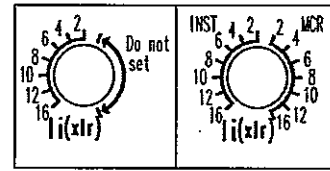
When the stop signal is made by the main contact, auxiliary switch (AX) or OCR alarm switch (AL).	Take the reading of the counter as it is.
When the stop signal is made through the test connector of ETR or alarm contacts of Power supply module (type: P3, P4 or P5).	Add 20ms (mechanical operating time) to the reading of the counter.

(5) Push **RESET** switch and start at (3), if testing again.

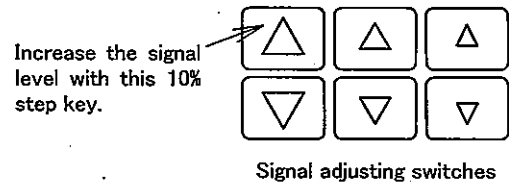
	<p>If ETR operates as LTD or INST in checking STD pick-up current, change the set value of INST/LTD, or change the test current. Moreover, ETR may operate as INST when checking STD operating time at Isd=10. In this case, lower the test current to near 140%Isd, or lower the test current after setting Tsd to "It OFF" temporarily.</p>
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### 5.5 INST Pick-up current test

- (1) When the MCR switch (\*option) is equipped, set  $I_i$  setting dial to "INST" side (See right figure).
- (2) Set the signal level to approximately 90% of  $I_i$ .
- (3) Push **START** switch while continuing to push a [L/S LOCK] button of ETR, then increase the signal level by using the "Signal adjusting switch", and then release it as soon as ETR trips.
- (4) Read the signal level indicated at the time.
- (5) Push **RESET** switch and start at (2), if testing again.

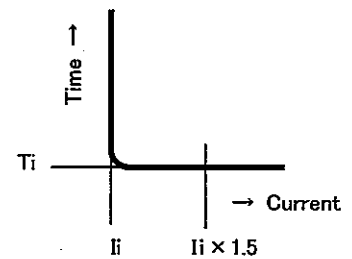


● INST (standard) ● MCR (\*option)  
(INST/MCR selectable)



### 5.6 INST operating time test

- (1) Set a desired signal level.  
For example, if  $I_i$  setting dial is set to 10, since  $1000\% \times 1.5 = 1500\%$ , set the signal level to **01500.0**.  
\*Where, 1.5 is a value that the operating time becomes flat.
- (2) Push **START** switch while continuing to push the [L/S LOCK] button of ETR.
- (3) After tripping, the operating time is indicated.



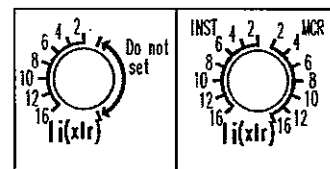
When the stop signal is made by the main contact, auxiliary switch (AX) or OCR alarm switch (AL).	Take the reading of the counter as it is.
When the stop signal is made through the test connector of ETR or alarm contacts of Power supply module (type: P3, P4 or P5).	Add 20ms (mechanical operating time) to the reading of the counter.

- (4) Push **RESET** switch and start at (2), if testing again.

When checking the short time operation such as INST operating time test, in order to measure the operating time with accuracy, push the "Test power manual connecting switch **VT**", and push **START** switch after the "Test power indicating LED" lighting.

### 5.7 MCR function check (\*Only when MCR switch is equipped)

- (1) Set  $I_i$  setting dial of ETR to "MCR" side.



● INST (standard) ● MCR (\*option)  
(INST/MCR selectable)

- (2) When the state of circuit breaker is off, ETR operates as INST.  
Check the INST operation in accordance with *section 5.5 and 5.6*.  
\* This serves as a substitute for checking the operation in instant of making contact of a breaker.  
INST operation in instant of making contact of the breaker cannot be checked.
- (3) Confirms that the breaker does not operate as INST even when the same test as *section 5.5 and 5.6* is carried out. In this case, it operates as STD in case of WS or WM type relay. In case of WB type relay, it does not trip.

### 5.8 GFR Pick-up current test (TRIP mode) (\*Only when G1 module is equipped)

(1) Set  $T_g$  (ground fault operating time) setting dial of ETR to the minimum (0.10s) of "TRIP" side.  
\* If the setting value of  $T_g$  is large, exact measurement cannot be performed in the following (4).

(2) Set the "Signal output pin" to [S2] and the rated current to **H 1.000** in accordance with section 4.1(5).

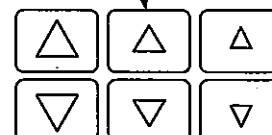
(3) Set the signal level to approximately 80% of  $I_g$  (ground fault pick-up current).

(4) Push **START** switch, and immediately increase the signal level with the "Signal adjusting switch", then release the switch as soon as ETR trips.

(5) Read the signal level indicated at the time.

(6) Push **RESET** switch and start at (3), if testing again.

Increase the signal level with this 1% step key.



Signal adjusting switches

### 5.9 GFR operating time test (TRIP mode) (\*Only when G1 module is equipped)

(1) Set  $T_g$  setting dial of ETR to "TRIP" side.

(2) Set the "Signal output pin" to [S2] and the rated current to **H 1.000** in accordance with section 4.1(5).

(3) Set the "Signal level indicator" to **○○○○○○○** by pushing the "Signal level mode switch **× INMAX / %IN**".

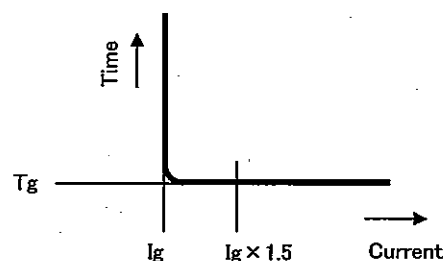
(4) Set a desired signal level.

For example, if  $I_g$  setting dial is set to 0.3, since  $30\% \times 1.5 = 45\%$ , set the signal level to **00045.0**.

\* Where, 1.5 is a value that the operating time becomes flat.

(5) Push **START** switch.

(6) After tripping, the operating time is indicated.



When the stop signal is made by the main contact, auxiliary switch (AX) or OCR alarm switch (AL).	Take the reading of the counter as it is.
When the stop signal is made through the test connector of ETR or alarm contacts of Power supply module (type: P3, P4 or P5).	Add 20ms (mechanical operating time) to the reading of the counter.

(8) Push **RESET** switch and start at (5), if testing again.



When checking the short time operation such as GFR operating time test, in order to measure the operating time with accuracy, push the "Test power manual connecting switch **VT**", and push the **START** switch after the "Test power indicating LED" lighting.

### 5.10 GFR Pick-up current test (ALARM mode) (\*Only when G1 module is equipped)

(1) Set  $T_g$  (ground fault operating time) setting dial of ETR to the minimum (0.10s) of "ALARM" side.  
 \* If the setting value of  $T_g$  is large, exact measurement cannot be performed in the following (5).

(2) Set the "Signal output pin" to [S2] and the rated current to **H 1,000** in accordance with *section 4.1(5)*.

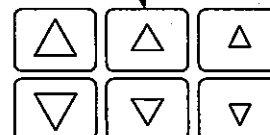
(3) Set the signal level to approximately 80% of  $I_g$  (ground fault pick-up current).

(4) Push **START** switch.

(5) Increase the signal level using the "Signal adjusting switch",  
 and take a reading of the counter at a point where ETR turns a [GFR] LED on.

(6) Push **RESET** switch and start at (3), if testing again.

Increase the signal level with this 1% step key.



Signal adjusting switches

### 5.11 GFR operating time test (ALARM mode) (\*Only when type P3, P4 or P5 module and G1 module are equipped)

(1) Set  $T_g$  setting dial of ETR to "ALARM" side.

(2) Supply power to ETR (between **P1** and **P2** of the circuit breaker's control circuit terminal block).

(3) Connect the "Stop signal input" on the back of tester and the contact terminal for GFR (between **513** and **544** of the circuit breaker's control circuit terminal block). Then set the "Stop signal input switch" to [a].

\*The terminal allocation for GFR ( **513** and **544** ) described in above is the assignment at the factory shipments. If this allocation is changed by using the display (DP1 or DP2), it differs from the above allocation.

(4) Set a desired signal level (See *section 5.9*).

(5) Push **START** switch.

(6) After operation, the operating time is indicated.

(7) Push **RESET** switch and start at (4), if testing again.

## 5.12 Trip check

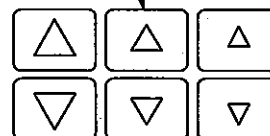
This function enables the circuit breaker to operate instantaneously. It is effective when checking panel sequence, resetting the memory effect for overcurrent and the like.

- (1) Set a test mode to [TC] (trip check).
- (2) In case of WM type relay, if MCR switch (\*option) is equipped, set li setting dial to "INST" side.  
\*In case of WB type relay, unless li setting dial is set to "INST" side, ETR does not trip.
- (3) Push **START** switch.
- (4) Confirms that the circuit breaker trips instantaneously.
- (5) Push **RESET** switch and start at (3), if testing again.

## 5.13 PAL pick-up current test

- (1) Set the signal level to approximately 80% of  $I_p$ .
- (2) Push **START** switch.
- (3) Increase the signal level using the "Signal adjusting switch", and take a reading of the counter at a point where [PAL] LED of ETR blinks.
- (4) Push **STOP** switch.
- (5) Push **RESET** switch and start at (1), if testing again.

Increase the signal level with this 1% step key.



Signal adjusting switches

## 5.14 PAL operating time test (\*Only when type P3, P4 or P5 of Power supply module is equipped)

- (1) Supply power to ETR (between **P1** and **P2** of the circuit breaker's control circuit terminal block).
- (2) Connect the "Stop signal input" on the back of tester and the contact terminal for PAL OUT (between **513** and **554** of the circuit breaker's control circuit terminal block). Then set the "Stop signal input switch" to [a].  
\*The terminal allocation for PAL OUT ( **513** and **554** ) described in above is the assignment at the factory shipments. If this allocation is changed by using the display (DP1 or DP2), it differs from the above allocation.
- (3) Set a desired signal level (See *section 5.2*).
- (4) Push **START** switch.
- (5) After operation, the operating time is indicated.
- (6) Push **RESET** switch and start at (3), if testing again.

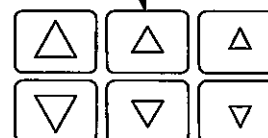


Since ETR has a memory effect for overcurrent state, when the operating time test is interrupted on the way, the operating time at the next test becomes short. This memory effect can be reset by tripping. Therefore, if operating time test is interrupted on the way, perform the next test after tripping ETR one-time. To trip, perform the trip check in accordance with 5.12

### 5.15 PAL2 pick-up current test (\*Only when AP module is equipped)

- (1) Set the signal level to approximately 80% of  $I_p2$ .
- (2) Push **START** switch.
- (3) Increase the signal level using the "Signal adjusting switch"; and take a reading of the counter at a point where [PAL2] LED of ETR blinks.
- (4) Push **STOP** switch.
- (5) Push **RESET** switch and start at (1), if testing again.

Increase the signal level with this 1% step key.



Signal adjusting switches

### 5.16 PAL2 operating time test (\*Only when P3, P4 or P5 module and AP module are equipped)

- (1) Supply power to ETR (between **P1** and **P2** of the circuit breaker's control circuit terminal block).
- (2) Connect the "Stop signal input" on the back of tester and the contact terminal for PAL2 OUT (between **513** and **544** of the circuit breaker's control circuit terminal block). Then set the "Stop signal input switch" to [a].  
\*The terminal allocation for PAL2 OUT ( **513** and **544** ) described in above is the assignment at the factory shipments. If this allocation is changed by using the display (DP1 or DP2), it differs from the above allocation.
- (3) Set a desired signal level (See *section 5.2*).
- (4) Push **START** switch.
- (5) After operation, the operating time is indicated.
- (6) Push **RESET** switch and start at (3), if testing again.



Since ETR has a memory effect for overcurrent state, when the operating time test is interrupted on the way, the operating time at the next test becomes short. This memory effect can be reset by tripping. Therefore, if operating time test is interrupted on the way, perform the next test after tripping ETR one-time. To trip, perform the trip check in accordance with 5.12.

### 5.17 OCR alarm switch (AL) check

The OCR alarm switch (AL) is a contact ("a" contact) of short time operation (30–50ms)<sup>Note</sup>. This time can be measured with the oscilloscope, the millisecond counter or the like.

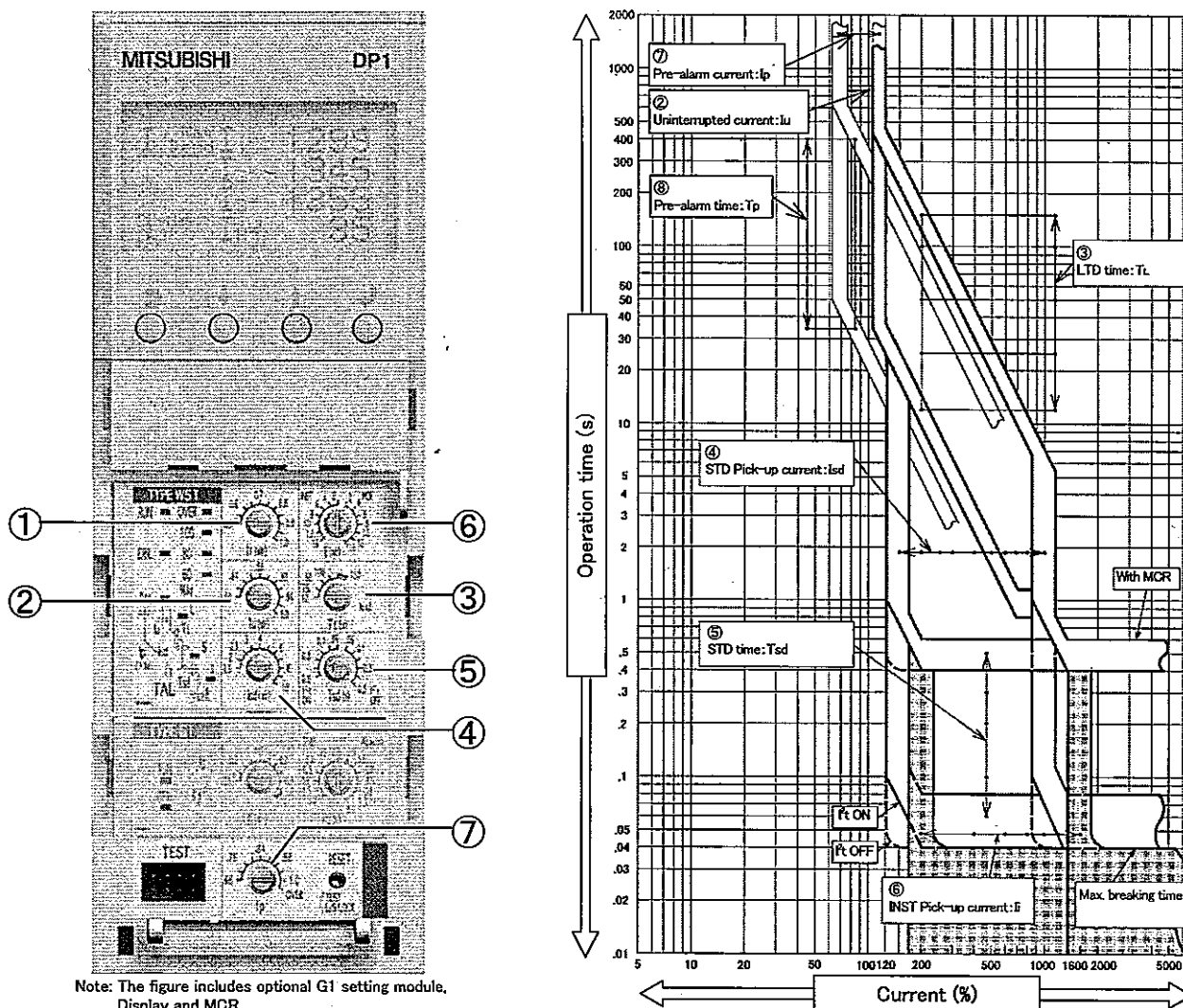
Note: In case of the manual reset type (MRE) (\*option), AL is output continuously. This contact output is not reset until pushing the manual reset button of breaker.



Y-2000 enables a check of operation even if breaker is in the state of OFF. However, as for AL checking, since AL is included in the trip mechanism, AL is output only when tripping from ON state. (AL cannot be output unless tripping actually).

## 6. Settings and accuracy

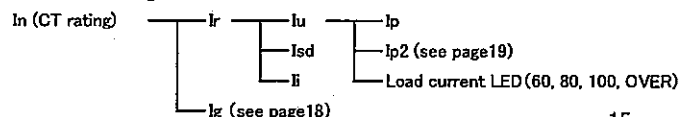
### 6.1 Settings and accuracy of type WS relay



No.	Setting item	Mark	Adjustable setting range		Accuracy
			AE630-SW~AE1600-SW AE2000-SW~AE3200-SW	AE2000-SWA AE4000-SWA	
①	Rated current setting	$I_r$	$0.5 \sim 1.0(0.05\text{step}) \times I_n$ (CT rating)		—
②	Uninterrupted current	$I_u$	$0.8 \sim 1.0 \times I_r(0.02\text{step})$ , Pick-up current: $1.15 \times I_u$		$1.05 \times I_u \dots$ Non pick-up $1.25 \times I_u \dots$ Pick-up
③	LTD time	TL	12-25-50-100-150s at $I_u \times 2$		$\pm 20\%$
④	STD Pick-up current	$I_{sd}$	$1.5-2-2.5-3-4-5-6-7-8-9-10 \times I_r$		$\pm 15\%$
⑤	STD time	$T_{sd}$	$0.5-0.4-0.3-0.2-0.1-0.06$ ( $I^2t$ ON) / $0.06-0.1-0.2-0.3-0.4-0.5s$ ( $I^2t$ OFF)		$\pm 20\%$ ( $0.06 \dots \pm 0.02s$ )
⑥	INST. Pick-up current	$I_i$	$16-12-10-8-6-4-2-2-4-6-8-10-12-16 \times I_r$ (INST) (MCR) WS1	$12-10-8-6-4-2-2-4-6-8-10-12 \times I_r$ (INST) (MCR) WS2	$\pm 15\%$
⑦	Pre-alarm current	$I_p$	$I_u \times 0.68 \sim 1.0(0.04\text{step})$ -OVER		$\pm 10\%$
⑧	Pre-alarm time	$T_p$	1/2 TL (after 1/2TL, PAL output contact turns on)		$\pm 20\%$

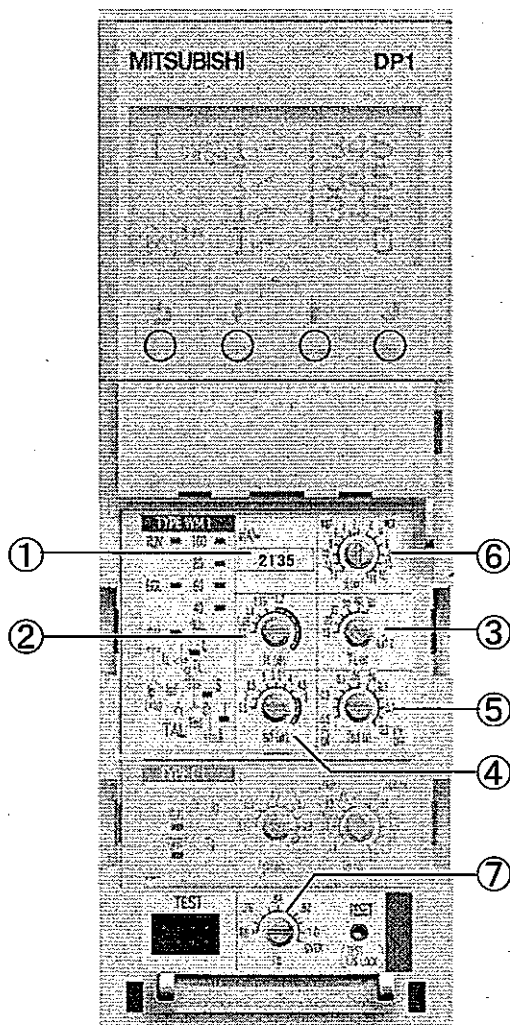
\*The table shows data obtained on the breakers provided with MCR (\*option). For breakers without MCR, the setting position for MCR is not provided.

Relation of setting dial

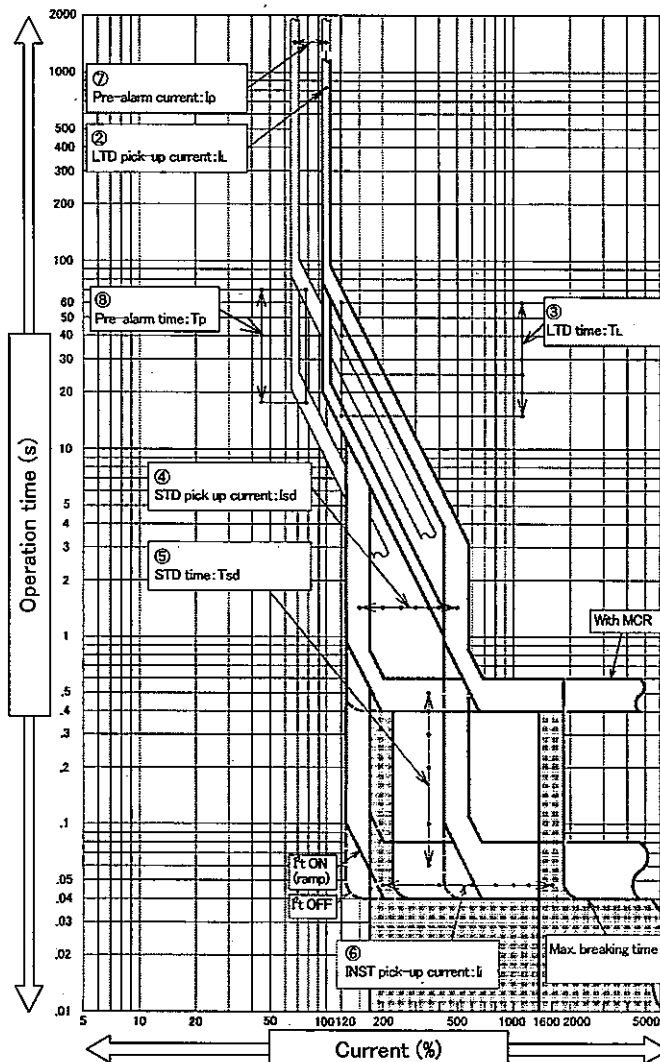




### 6.2 Settings and accuracy of type WM relay



Note: The figure includes optional G1 setting module, Display and MCR.

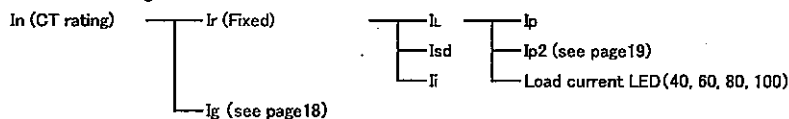


No.	Setting item	Mark	Adjustable setting range		Accuracy
			AE630-SW~AE1600-SW AE2000-SW~AE3200-SW	AE2000-SWA, AE4000-SWA	
①	Rated current setting	I <sub>r</sub>	0.63 ~ 1.0 × I <sub>n</sub> (*Set to specified current value before shipment (fixed))		—
②	LTD pick-up current	I <sub>L</sub>	1.0-1.05-1.1-1.15-1.2 × I <sub>r</sub>		± 5%
③	LTD time	T <sub>L</sub>	15-20-25-30-40-60s at I <sub>L</sub> × 1.2		±20%
④	STD pick-up current	I <sub>sd</sub>	1.5-2-2.5-3-3.5-4-4.5-5 × I <sub>r</sub>		±15%
⑤	STD time	T <sub>sd</sub>	0.5-0.4-0.3-0.2-0.1-0.06 (I <sup>2</sup> t ON) 0.06-0.1-0.2-0.3-0.4-0.5s (I <sup>2</sup> t OFF)		±20% (0.06...±0.02s)
⑥	INST. pick-up current	I <sub>i</sub>	16-12-10-8-6-4-2-2-4-6-8-10-12-16 × I <sub>r</sub> (INST) (MCR) WM1	12-10-8-6-4-2-2-4-6-8-10-12 × I <sub>r</sub> (INST) (MCR) WM2	±15%
⑦	Pre-alarm current	I <sub>p</sub>	I <sub>L</sub> × 0.68 ~ 1.0(0.04step)-OVER		±5%
⑧	Pre-alarm time	T <sub>p</sub>	1/2 T <sub>L</sub> (after 1/2T <sub>L</sub> , PAL output contact turns on)		±20%

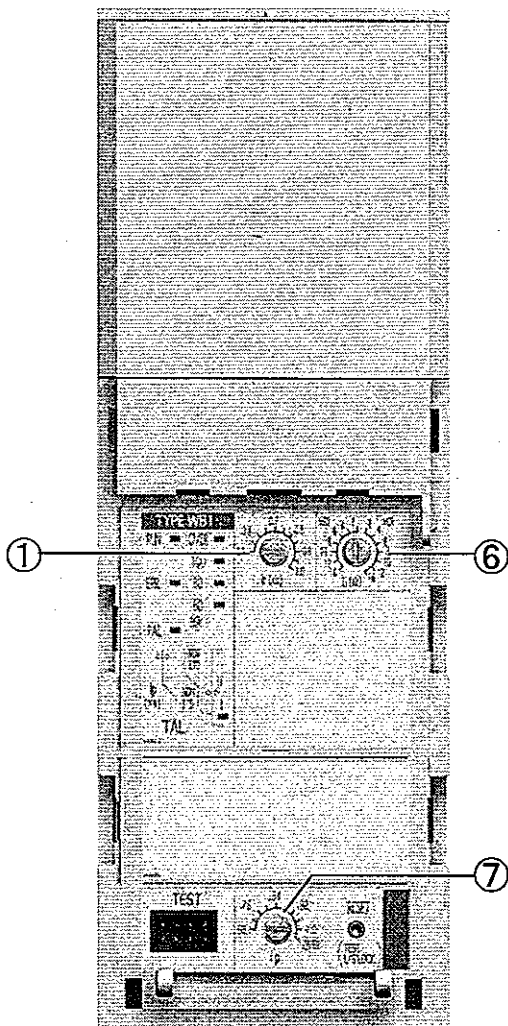
\*The table shows data obtained on the breakers provided with MCR (\*option). For breakers without MCR, the setting position for MCR is not provided.

\*When the WM type relay is used, the pre-alarm current at the setting, OVER, is the same as that at 1.0.

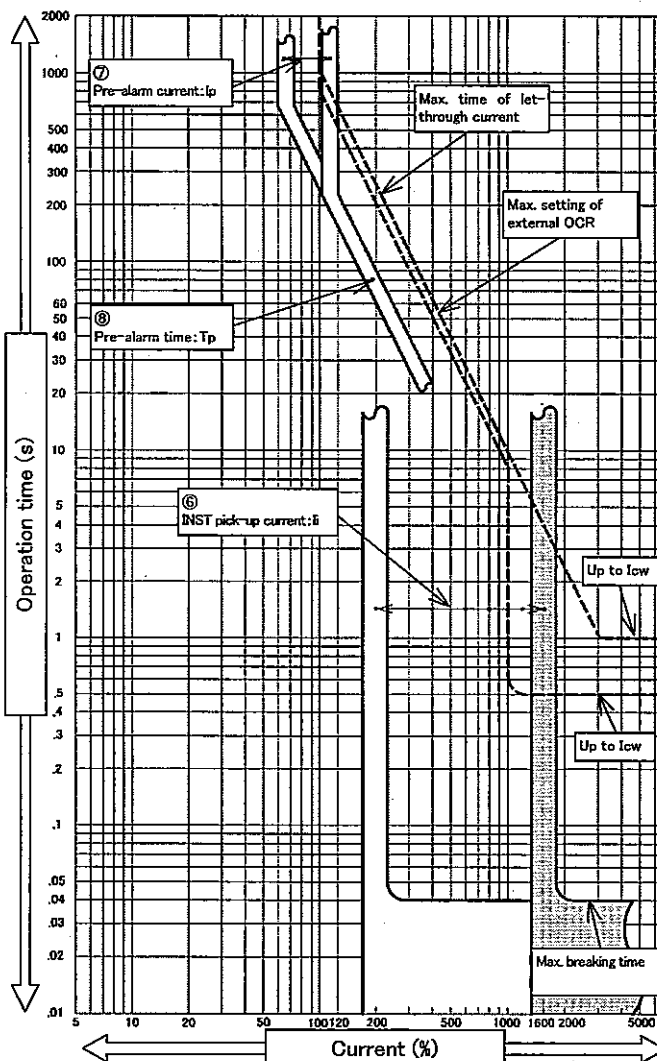
Relation of setting dial



6.3 Settings and accuracy of type WB relay



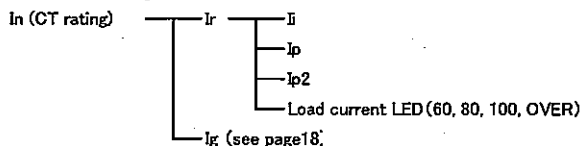
Note: The figure includes MCR function.



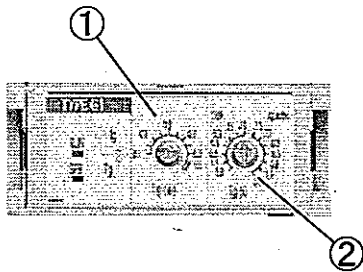
No.	Setting item	Mark	Adjustable setting range		Accuracy
			AE630-SW~AE1600-SW AE2000-SW~AE3200-SW	AE2000-SWA, AE4000-SWA	
①	Rated current setting	$I_r$	$0.5 \sim 1.0(0.05\text{step}) \times I_n$ (CT rating)		—
⑥	INST. pick-up current	$I_i$	$\frac{16-12-10-8-6-4-2-2-4-6-8-10-12-16}{(INST) (MCR)} \times I_r$	$\frac{12-10-8-6-4-2-2-4-6-8-10-12}{(INST) (MCR)} \times I_r$	$\pm 15\%$
⑦	Pre-alarm current	$I_p$	$I_r \times 0.68 \sim 1.0(0.04\text{step}) - \text{OVER}$		$\pm 5\%$
⑧	Pre-alarm time	$T_p$	75s at $I_r \times 2$ (after 1/2TL, PAL output contact turns on)		$\pm 20\%$

\*The table shows data obtained on the breakers provided with MCR (\*option). For breakers without MCR, the setting position for MCR is not provided.

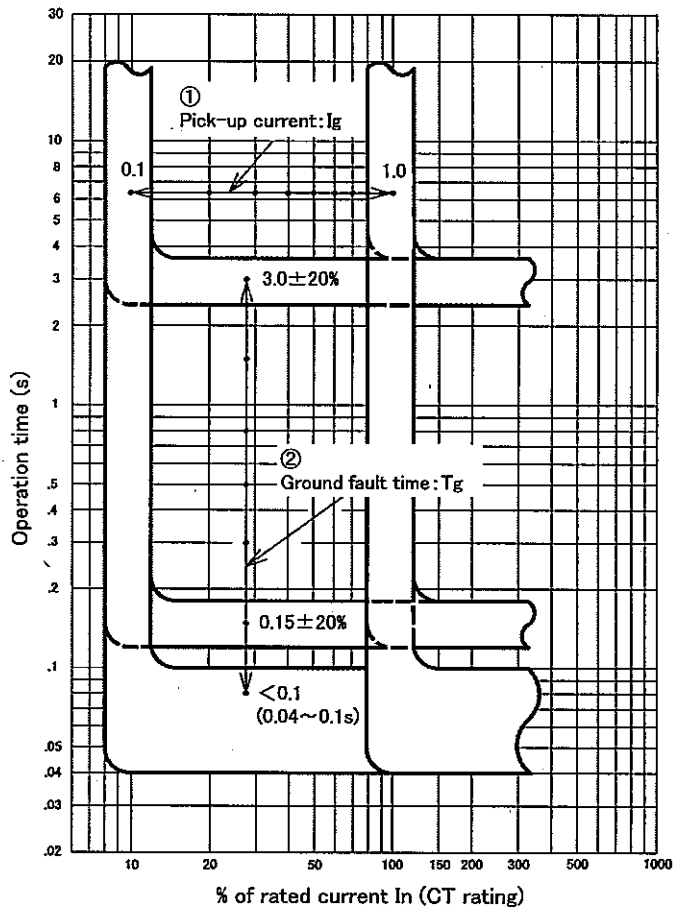
Relation of setting dial



### 6.4 Settings and accuracy of G1 module

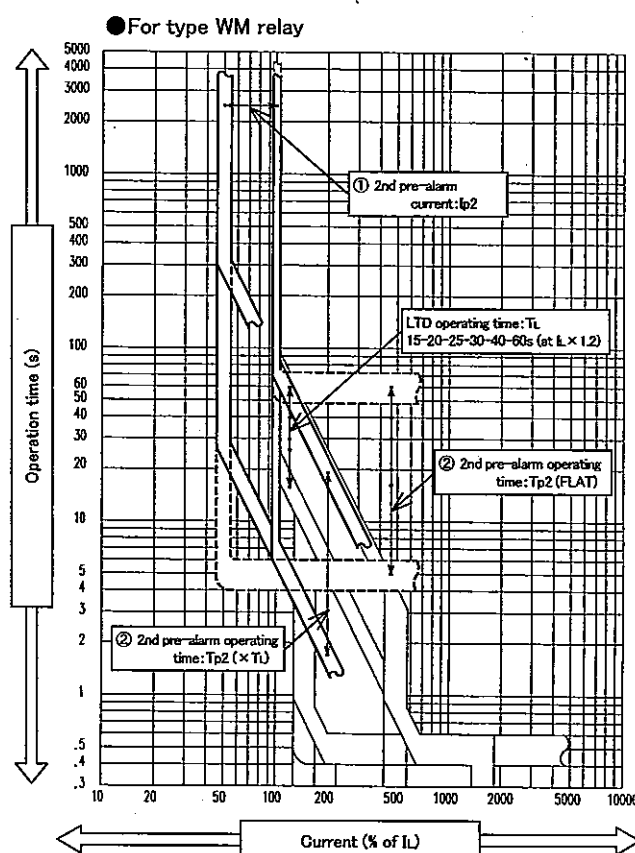
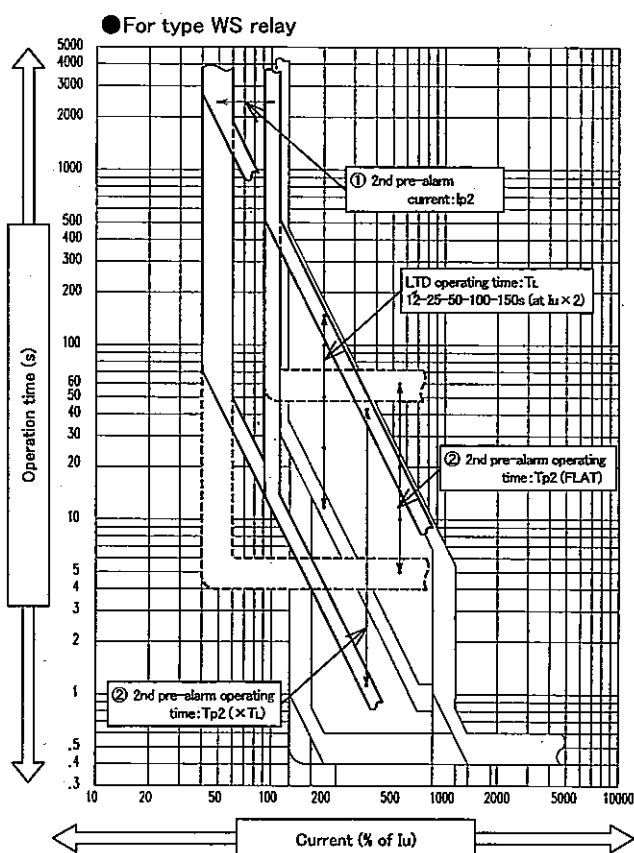
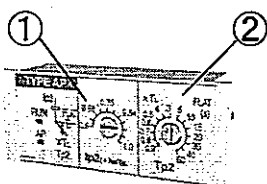


Ground fault protection characteristics



No.	Setting item	Mark	Adjustable setting range	Accuracy
①	Ground fault Pick-up	$I_g$	$0.1 \sim 1.0 \times I_n$ (0.1step)	$\pm 20\%$
②	Ground fault time	$T_g$	$3.0-1.5-0.8-0.5-0.3-0.15- < 0.1$ - $< 0.1-0.15-0.3-0.5-0.8-1.5-3.0$ s (Trip) (Alarm)	$\pm 20\%$

### 6.5 Settings and accuracy of AP module



No.	Setting items	Mark	Adjustable setting range	Accuracy
①	2nd pre-alarm current	Ip2	WS type 0.5-0.6-0.7-0.8-0.84-0.88-0.92-0.96-1.0 × Iu	WS type ±10%
			WM type 0.5-0.6-0.7-0.8-0.84-0.88-0.92-0.96-1.0 × Il	WM type ±5%
②	2nd pre-alarm operating time	Tp2	0.9-0.8-0.7-0.6-0.5-0.4-0.3 × Tl - 5-10-15-20-30-40-60s (× Tl) (FLAT)	±20%

# 7. Inspection form

## Inspection report form for WS type relay

Date:

Checked person:

Name of Panel/Distribution system:					
ACB Type					
CT rating (In)					
Serial number					
ETR type					
ETR serial number					
External appearance	There must be no breakage of ETR.				There must be no breakage.
	There must be no loosening of terminal screws of Control circuit terminal block.				There must be connected securely.
Confirmation of settings	Rated current setting (Ir)				Fill in the setting values. If setting was changed during check, reset the value to the previous settings at the completion of check.
	LTD	Uninterrupted current (Iu)			
		Operating time (TL)			
	STD	Pickup current (Isd)			
		Operating time (Tsd)			
	INST	I <sup>ft</sup> ON/OFF settings			
		Pickup current (Ii)			
	PAL	INST/MCR settings			
		Pickup current (Ip)			
	GFR <sup>3)</sup>	Operating time (Tp)			
		Pickup current (Ig)			
		Operating time (Tg)			
	ER <sup>3)</sup>	TRIP/ALARM settings			
		Pickup current (IΔn)			
Operating time (Te)					
PAL2 <sup>3)</sup>	TRIP/ALARM settings				
	Pickup current (Ip2)				
Pickup/ Operating time	LTD	Operating time (Tp2)			105% - 125%Iu
		Pickup current (%)			TL±20% at 200%Iu
	STD <sup>2)</sup>	Pickup current (%)			Isd±15%
		Operating time (s)			Tsd±20% at 150%Isd
	INST <sup>1)</sup>	Pickup current (%)			Ii±15%
		Operating time (s)			≤40ms at 150%Ii
	PAL	Pickup current (%)			Ip±10%
		Operating time (s)			TL/2±20% at 200%Iu
	GFR <sup>3)</sup>	Pickup current (%)			Ig±20%
		Operating time (s)			Tg±20% at 150%Ig
	ER <sup>3),4)</sup>	Pickup current (%)			IΔn+0%-30%
		Operating time (s)			Te±20% at 150%IΔn
	PAL2 <sup>3)</sup>	Pickup current (%)			Ip2±10%
		Operating time (s)			Tp2±20% at 200%Iu
Outputs	Trip indicator LED (L, S, I, PAL, GFR <sup>3)</sup> , ER <sup>3),4)</sup> , PAL2 <sup>3)</sup> )				Only if Power supply with alarm contact (type: P3/P4/P5) is equipped. AL (*standard): 30ms (1pulse) MRE (*option): continuously
	Trip indicator contact output (L, S/I, PAL, GFR <sup>3)</sup> /ER <sup>3),4)</sup> /PAL2 <sup>3)</sup> )				
	OCR alarm switch (AL) output <sup>5)</sup>				
Result					
Other items to be checked.					

Note1): If ETR operates as LTD or STD in checking INST pick-up current, use the L/S LOCK (LTD/STD LOCK) button of ETR.  
 Note2): If ETR operates as LTD or INST in checking STD pick-up current, change the set value of INST/LTD, or change the test current. Moreover, ETR may operate as INST when checking STD operating time at Isd=10. In this case, lower the test current to near 140%Isd, or lower the test current after setting Tsd to "I<sup>ft</sup> OFF" temporarily.  
 Note3): Check and fill in the blanks only if any Optional setting module (G1/E1/AP) is equipped.  
 Note4): Please make a reference separately about the ER operating check method.  
 Note5): Since AL is included in the trip mechanism, AL is output only when tripping from ON state. (AL cannot be output unless tripping actually).

**Inspection report form for WM type relay**

Date:

Checked person:

Name of Panel/Distribution system:					
ACB Type					
CT rating (In)					
Serial number					
ETR type					
ETR serial number					
External appearance	There must be no breakage of ETR.			There must be no breakage.	
	There must be no loosening of terminal screws of Control circuit terminal block.			There must be connected securely.	
Confirmation of settings	Rated current setting (Ir)			Fill in the setting values. If setting was changed during check, reset the value to the previous settings at the completion of check.	
	LTD	Pickup current (IL)			
		Operating time (TL)			
	STD	Pickup current (Isd)			
		Operating time (Tsd)			
		I <sup>2</sup> t ON/OFF settings			
	INST	Pickup current (Ii)			
		INST/MCR settings			
	PAL	Pickup current (Ip)			
		Operating time (Tp)			
	GFR <sup>3)</sup>	Pickup current (Ig)			
		Operating time (Tg)			
		TRIP/ALARM settings			
	ER <sup>3)</sup>	Pickup current (IΔn)			
Operating time (Te)					
TRIP/ALARM settings					
PAL2 <sup>3)</sup>	Pickup current (Ip2)				
	Operating time (Tp2)				
Pickup/ Operating time	LTD	Pickup current (%)		IL±5%	
		Operating time (s)		TL±20% at 120%IL	
	STD <sup>2)</sup>	Pickup current (%)		Isd±15%	
		Operating time (s)		Tsd±20% at 150%Isd	
	INST <sup>1)</sup>	Pickup current (%)		Ii±15%	
		Operating time (s)		≤40ms at 150%Ii	
	PAL	Pickup current (%)		Ip±5%	
		Operating time (s)		TL/2±20% at 120%IL	
	GFR <sup>3)</sup>	Pickup current (%)		Ig±20%	
		Operating time (s)		Tg±20% at 150%Ig	
ER <sup>3),4)</sup>	Pickup current (%)		IΔn+0%~30%		
	Operating time (s)		Te±20% at 150%IΔn		
PAL2 <sup>3)</sup>	Pickup current (%)		Ip2±5%		
	Operating time (s)		Tp2±20% at 120%IL		
Outputs	Trip indicator LED (L, S, I, PAL, GFR <sup>3)</sup> , ER <sup>3),4)</sup> , PAL2 <sup>3)</sup> )				
	Trip indicator contact output (L, S/I, PAL, GFR <sup>3)</sup> /ER <sup>3),4)</sup> /PAL2 <sup>3)</sup> )			Only if Power supply with alarm contact (type: P3/P4/P5) is equipped.	
	OGR alarm switch (AL) output <sup>5)</sup>			AL (*standard): 30ms (1pulse) MRE (*option): continuously	
Result					
Other items to be checked.					

Note1): If ETR operates as LTD or STD in checking INST pick-up current, use the L/S LOCK (LTD/STD LOCK) button of ETR.

Note2): If ETR operates as LTD or INST in checking STD pick-up current, change the set value of INST/LTD, or change the test current.

 Moreover, ETR may operate as INST when checking STD operating time at Isd=10. In this case, lower the test current to near 140%Isd, or lower the test current after setting Tsd to "I<sup>2</sup>t OFF" temporarily.

Note3): Check and fill in the blanks only if any Optional setting module (G1/E1/AP) is equipped.

Note4): Please make a reference separately about the ER operating check method.

Note5): Since AL is included in the trip mechanism, AL is output only when tripping from ON state. (AL cannot be output unless tripping actually).

**Inspection report form for WB type relay**

Date:

Checked person:

Name of Panel/Distribution system:						
ACB Type						
CT rating (In)						
Serial number						
ETR type						
ETR serial number						
External appearance	There must be no breakage of ETR.				There must be no breakage.	
	There must be no loosening of terminal screws of Control circuit terminal block.				There must be connected securely.	
Confirmation of settings	Rated current setting (Ir)				Fill in the setting values. If setting was changed during check, reset the value to the previous settings at the completion of check.	
	INST	Pickup current (Ii)				
		INST/MCR settings				
	PAL	Pickup current (Ip)				
		Operating time (Tp)				
	GFR <sup>1)</sup>	Pickup current (Ig)				
		Operating time (Tg)				
		TRIP/ALARM settings				
	ER <sup>1)</sup>	Pickup current (IΔn)				
		Operating time (Te)				
TRIP/ALARM settings						
PAL2 <sup>1)</sup>	Pickup current (Ip2)					
	Operating time (Tp2)					
Pickup/ Operating time	INST	Pickup current (%)			$I_i \pm 15\%$	
		Operating time (s)			$\leq 40\text{ms at } 150\%I_i$	
	PAL	Pickup current (%)			$I_p \pm 10\%$	
		Operating time (s)			$75\text{s} \pm 20\% \text{ at } 200\%I_r$	
	GFR <sup>1)</sup>	Pickup current (%)			$I_g \pm 20\%$	
		Operating time (s)			$T_g \pm 20\% \text{ at } 150\%I_g$	
	ER <sup>1,2)</sup>	Pickup current (%)			$I_{\Delta n} + 0\% - 30\%$	
		Operating time (s)			$T_e \pm 20\% \text{ at } 150\%I_{\Delta n}$	
PAL2 <sup>1)</sup>	Pickup current (%)			$I_{p2} \pm 10\%$		
	Operating time (s)			$T_{p2} \pm 20\% \text{ at } 200\%I_r$		
Outputs	Trip indicator LED (I, PAL, GFR <sup>1)</sup> , ER <sup>1,2)</sup> , PAL2 <sup>1)</sup>					
	Trip indicator contact output (I, PAL, GFR <sup>1)</sup> /ER <sup>1,2)</sup> /PAL2 <sup>1)</sup>				Only if Power supply with alarm contact (type: P3/P4/P5) is equipped.	
	OGR alarm switch (AL) output <sup>3)</sup>				AL (*standard): 30ms (1pulse) MRE (*option): continuously	
Result						
Other items to be checked.						

Note1): Check and fill in the blanks only if any Optional setting module (G1/E1/AP) is equipped.

Note2): Please make a reference separately about the ER operating check method.

Note3): Since AL is included in the trip mechanism, AL is output only when tripping from ON state. (AL cannot be output unless tripping actually).

## 8. SERVICE NETWORK

Country / Region	Company	Address	Telephone
Australia	Mitsubishi Electric Australia Pty. Ltd	348 Victoria Road, Rydalmere, N.S.W. 2116, Australia	+61-2-9684-7566
Belgium	Emac S.A.	Industrialaan 1, B-1702 Groot-Bijgaarden, Belgium.	+32-(0)2-4810211
Chile	RHONA S.A.	Via. Agus Santa 4211 Casilla 30-D (P.O. Box) Viña Del Mar, Chile	+56-32-320652
China	RYODEN AUTOMATION (SHANGHAI) LTD.	(Shanghai) 3F, Block 5, 103 Cao Bao Road, Shanghai, China	+86-(0)21-6475-3228
	SHANGHAI SETSUYO TRADING CO.,LTD.	Shanghai Everbright Convention & Exhibition Center Room2306, Block D. 80, Cao bao Rd., Xuhui District Shanghai, P. R. China	+86-(0)21-6432-6698
Colombia	Proelectrico Representaciones S.A.	Cra 53 No 29C-73 U.I.C.- Medellín. COLOMBIA.	+57-4-235-00-28
Denmark	Louis Poulsen CO. A/S	Geminivej 32, DK-2670 Greve, Denmark.	+45-(0)43-95-95-95
Egypt	CAIRO ELECTRICAL GROUP	9 Rostoum Street Garden City, APT. 5, P.O. BOX: 165-11516, Cairo-Egypt.	+20-2-7961337
Germany	Mitsubishi Electric Europe B.V. German Branch.	Gothaer Strasse 8, 40880 Ratingen, Germany.	+49-(0)2102-4860
Greece	Drepanias Antonios S.A.	52, Arkadias STR.GR 121 32. Peristeri Athens Greece.	+30-1-57-81-599-699
Hong Kong	RYODEN AUTOMATION LIMITED	10/F Manulife Tower 169 Electric Road North Point, Hong Kong.	+852-28878870
Indonesia	P.T.SAHABAT INDONESIA.	JL Muara Karang Selatan Blok A/Ulara No.1 kav. NO.11 P.O. Box 5045/Jakarta/11050. Jakarta Indonesia.	+62-(0)21-6621780
Ireland	Mitsubishi Electric Europe B.V. Irish Branch.	Westgate Business Park, Ballymount, Dublin 24, Ireland.	+353-(0)1-4505007
Italy	Mitsubishi Electric Europe B.V. Italy	C.D.Colleoni-P.Persoo Ing.2, Via Paracelso 12 1-20041 Agrate Brianza (MI)	+390-39-60-531
Israel	GINO INDUSTRIES LTD.	26, Ophir street, IL-32235 Haifa, Israel	+972-(0)4-867 06 56
Korea	MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD.	2 Fl. Dong Seo Game Channel Bldg., 1F 660-11 Deungchon-Dong, Kanguseo-Ku, Seoul, 157-030 Korea	+82-2-3668-6567
Laos	SOCIETE LAO IMPORT-EXPORT	43-47 Lane Xang Road P.O. BOX 2789 VT Vientiane, Laos	+856-21-215043, 21-215110
Lebanon	COMPTOIR D'ELECTRICITE GENERALE INTERNATIONAL	Cebaco Center-Block A, Autostrade Dora, P.O. BOX: 90-1314 Beirut-Lebanon.	+961-1-240430
Malaysia	mitric Sdn Bhd	12A, Jalan Pemberita U1/49, Temasya Industrial Park, Glenmarie, 40150 Shah Alam, Selangor, Malaysia	+603-5569-3748
Myanmar	PEACE MYANMAR ELECTRIC CO., LTD.	NO. 137/139 Botataung Pagoda Road, Botataung Town Ship 11161, Yangon, Myanmar.	+95-(0)1-202589, 202449, 202590
Nepal	Watt & Volt House Co., Ltd.	KHA 2-65, Volt House Dilli Bazar Post Box: 2108, kathmandu, Nepal	+977-1-411330
New Zealand	Melco Sales (N.Z.) Ltd.	1 Parliament Street Lower Hutt, New Zealand.	+64-4-569-7350
Norway	SCANELEC	Leivikasen 43B, N5020 Bergen, Norway.	+47-55-506000
Pakistan	Prince Electric Co.	16 Brandreth Road Lahore 54000, Pakistan.	+92-(0)42-7654342
Philippines	EDISON ELECTRIC INTEGRATED, INC.	24th Fl. Galleria Corporate Center Edsa Cr, Ortigas Ave. Quezon City, Metro Manila, Philippines.	+63-(0)2-643-8691
Poland	MPL Technology Sp zo.o.	ul. Sliczna 36 31-444 Krakow, Poland.	+48-(0)12-632-28-85
Saudi Arabia	CENTER OF ELECTRICAL GOODS	Al-Nabhaniya Street-4Th Crossing, Al-Hassa Road, P.O. BOX: 15955, Riyadh 11454, Saudi Arabia.	+966-1-4770149
Singapore	MITSUBISHI ELECTRIC ASIA PTE LTD.	307 Alexandra Road #05-01/02 Mitsubishi Electric Building Singapore 159943	+65-473-2308
Slovenia	INEA d.o.o.	Ljubljanska 80, SI-61230 Domzale, Slovenia.	+386-(0)17-21 80 00
South Africa	Circuit Breaker Industries LTD.	Private Bag 2016, Isando 1600, Johannesburg, South Africa	+27-11-928-2000
Spain	Mitsubishi Electric Europe B.V. Spanish Branch.	Caretera De Rubi 76-80, 08190 - Sant Cugat Del Valles (Barcelona) Spain	+34-93-595-3131
Sweden	Euro Energy Components AB	Box 103 48 S-434 24 Kungsbacka, Sweden.	+46-(0)300-69 00 40
Switzerland	Trielec A G	Mühlentalstrasse 136, 8201 Schaffhausen, Switzerland	+41-(0)52-6258425
Taiwan	Setsuyo Enterprise Co., Ltd.	6F, NO. 105 Wu-Kung 3rd rd., Wu-Ku Hsiang, Taipei Hsien Taiwan	+886-(0)2-2298-8889
Thailand	UNITED TRADING & IMPORT CO. LTD.	77/12 Bumrungruang Road, Klong Mahanak, Pomprab Bangkok 10100.	+66-223-4220-3
The Netherlands	Imtech Marine & Industry	Postbox 5054, NL-3008 AB-Rotterdam, Netherlands.	+31-(0)10-487 19 11
Turkey	GTS	Fahri Gziden Sokak,Hacaloglu Apt. No.22/6 TR-80280 Gayrettepe/Istanbul,Turkey.	+90-(0)212-2674011
U.K.	Mitsubishi Electric Europe B.V. UK-Branch.	Travellers Lane, Hatfield, Herts, AL10 8xB, U.K.	+44-(0)1707-276-100
Uruguay	Fierro Vignoli S.A.	P.O. box 20022/Suc Upae, Montevideo, Uruguay.	+598-2-92-08-08
Venezuela	ADESCO C.A.	Ue 8, Calpon Elinsu, La Urbina-EDO, Miranda P.O. BOX 78034 Caracas 1074A., Venezuela	+58-2-241-7634
Vietnam	SA GIANG TECHNO CO., LTD.	47-49 Hoang Sa St., Da Kao Ward, D.1, HCMC	+84-8-910 4763 / 4758 / 4759



MITSUBISHI Low-Voltage Air Circuit Breakers World Super AE

# Field test devise Y-2000 for AE-SW series