TSURUGA

MODEL 850A

ACW/IR AUTO TESTER

Operation Manual

I-02446

FOR SAFE USE

For safe use of this tester, please observe the following warning and caution.

⚠ Regarding safety symbols

In order to help the users to use the testers safely, the following symbols are used in this manual.

ϟ 、⚠ Place where there is a dangerous high voltage.

⚠ Warning It shows the content that a dangerous situation is possible which may cause a fatal accident or severe injury in case the tester is mishandled.

⚠ Caution It shows the content that a dangerous situation is possible which may cause a minor injury to user or only material damage in case the tester is mishandled.

⚠ Warning

●This tester is designed to output a high voltage. As there is a danger of an electric shock, please follow the directions below:

・Do not touch output terminal, high voltage cables or test samples during the test.
The places marked with ⚠ on the tester are the dangerous parts where the high voltage is generated.

・Make sure to connect the protective ground terminal to the earth.

・Do not short-circuit the output to the ground or commercial power supply line. It is dangerous as the housing of the tester is charged with high voltage. It also causes the breakdown of the tester.

・When operating the tester, put on the rubber gloves of an electric operation purpose.

・For the connection to the test specimen, use the enclosed high-voltage cable or an electric cable that confirms to the operating voltage.

●Place for installation

・Never use or install this tester in the place where explosive or flammable materials as mentioned bel ow are used or stored.

(Occupational Safety and Health Act, Enforcement Regulations Appendix Table 1 Hazardous Materials)

[Explosive materials], [Ignitable materials], [Inflammable materials], [Flammable gas],

[Oxidizing materials]

※This tester uses metal internally. There is a risk of deterioration due to the occurrence of corrosion or rust and explosion or ignition by an electric spark.

・Do not place objects on top of this tester or use it as a footstool.

※It affects the heat dissipation causing internal temperature rise and break-down.

※There is a risk that the upper part is deformed.

●Storage

・Take care that the water drops like from rain do not wet the tester.
※There is a risk of electric shock or malfunction.

・Do not place the tester sideways. Take care during handling and do not let it fall down due to the vibration etc.
※There is a risk of damage of internal mechanism or malfunction.

⚠ Caution

●Do not use the tester in the following places

Followings can cause the trouble due to break-down or malfunction.

- Rain, water drops or direct sunlight places.
- Places having high temperature, high humidity , dust and corrosive gas.
- Places having external noise, radio waves or static electricity.
- Places which are unstable or having lot of mechanical vibrations or shock.
- Places where high sensitivity measuring testers or receivers are located nearby.

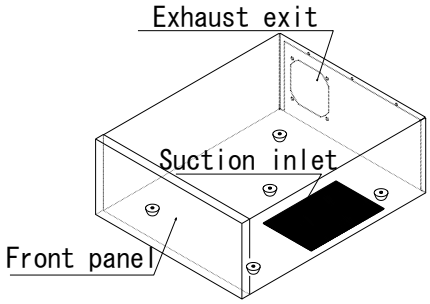
・Do not open the case or modify the tester as it may cause a danger of an electric shock or other troubles.

・If the operation is abnormal, turn off the power supply switch immediately and unplug the power cord.

・Make sure to stop the use and turn off the power supply during the maintenance or checking.

・Do not use the tester where the ventilation is poor.

Cooling system of this tester is forced air cooling from the rear panel. Mainly it takes in the air from the bottom and discharge to the rear side. As heat may be trapped and become the reason for the fire, always keep space of more than 10cms between the top, side, rear and the walls. In between the bottom surface and the floor (the height of rubber foot is about 14mm), do not place any object like paper, plastic etc. which can be easily sucked in.



●Apply the voltage to capacitance load (test sample)

The output voltage may rise higher than the case of no load depending upon the capacitance value of the load.
Also, in case of voltage dependent load (test sample), the waveform distortion may occur.
In case of test voltage 2kV, the influence of capacitance less than 2000pF can be ignored.

●Transportation

・The weight of this product is approximately 18Kg without accessories. To lift this product, fold your knees properly, not to hurt your back.

・Hold the chassis (bottom plate) and carry it with the 2 persons during transportation.

Remove all the objects laying on the floor to avoid the risk of falling.

Do not carry the tester holding its red bushing of high voltage terminal section (refer to ③ of "1. Par t names and functions").

※The bushing (red) may get damaged and there is a risk of serious injury when this product falls down.

・Minimize the mechanical vibration or shock when transporting the tester.

※There is a risk of damage of internal mechanism or malfunction.

●Regarding Interlock

This tester is provided with interlock function.
No test can be made when interlock function is in operation.
The interlock function can be released by plugging the enclosed remote /out plug into the remote I/O connector ④ and pressing the stop switch ⑥.

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Preface

For proper use of this tester, read these instructions carefully before initial operation. Make sure that this instruction manual is available to the responsible person for the operation. Besides, keep this manual near the tester so that the operator can read it any time.

Functions

Based on the guideline of safety standard and material safety act of electrical goods,
this tester can conduct the test of withstand voltage and insulation resistance of electronic devices and electronic parts.

As this tester handles the high voltage, so it is designed with a lot of protective functions and a number of considerations for the safety of the users.

- The withstand voltage tester has the capability of maximum output of 5kV and output capacity of 500VA.
- Precise test can be made due to upper, lower limit current setting and the timer function.
- As the insulation tester, this model is provided with 2 ranges of DC500/DC1000V.
- The displays of test voltage, current and test time are easy-to-read bu using Liquid Crystal Display (LCD).
- 10 sets of memory are equipped which can write and read the test conditions.
- It is possible to control input of the start/stop of the test from the outside by remote I/O connector. Besides, matching with the state of this tester, the output signals like “waiting”, “under test” or “decision result” etc. are output in open collector.

Confirmation prior to use

Inspection at the time of unpacking

（1）When unpacking

When the tester is delivered, check whether it has been damaged in transit and unpack it carefully. In case the tester does not operate as per the specification due to damage, contact the dealer from where you have purchased or sales office.

（2）Checking of the contents

Check the packing box which contains the main item and the standard accessories as listed below.

List of accessories

Operation manual (Main document)		CD
RS-232C Interface manual		CD
Safety precautions		1set
High voltage cable	2m	1 pair
Earth wire	3m	1 piece
Power supply cord	2.5m	1 piece
Remote I/O plug		1 piece（36P）

⚠ Caution

・For external communication RS-232C（D sub 9 pin model 5881-11-018）
When the customer procures it, it is requested to use the inch pitch screw type.

Cautions for handling

Since this tester deals with high voltage, it is designed paying special attention to the safety. However, it is still dangerous as it outputs high voltage of max. 5kV. An erroneous handling may cause fatal accident. In order to avoid any accident, strictly observe the following cautions and take utmost care for safety.

⚠ Warning

If the earthing is insufficient, there is a risk of electric shock.

（1）Make sure to connect the protective ground terminals (rear panel) to the earth. If the grounding is insufficient and the output is short-circuited to the earth or power supply line, the tester housing is charged with high voltage and it is very dangerous when the operator touches the outer box. Check if the earthing cable is disconnected or not.

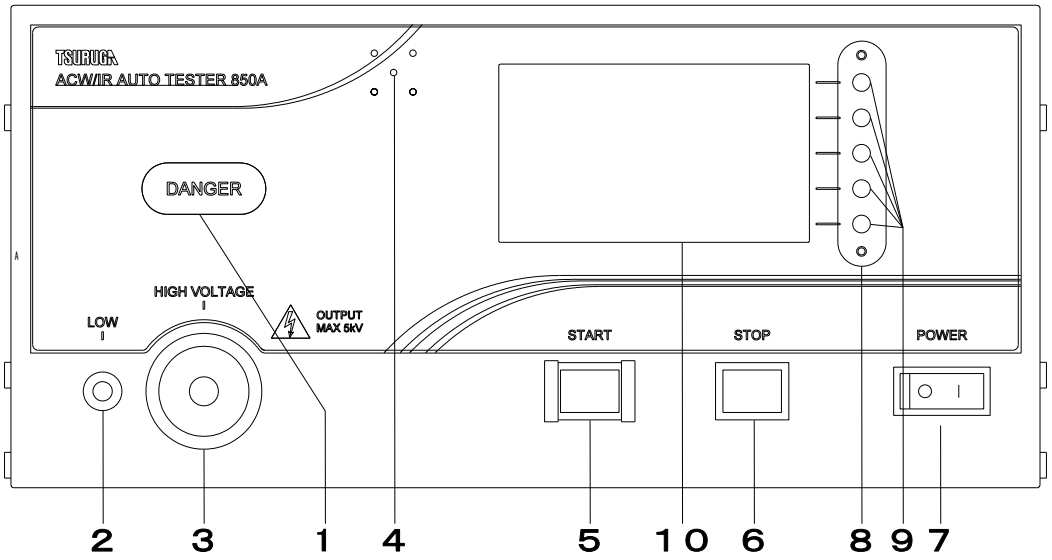
（2）During the test, never touch the output terminals, high voltage cable and test samples.

（3）When making a connection to the test sample, with output OFF , connect the LOW side prior to other.

（4）When operating this tester, put on rubber gloves for electric shock prevention.

1. Names and functions of each part

1.1 Front panel

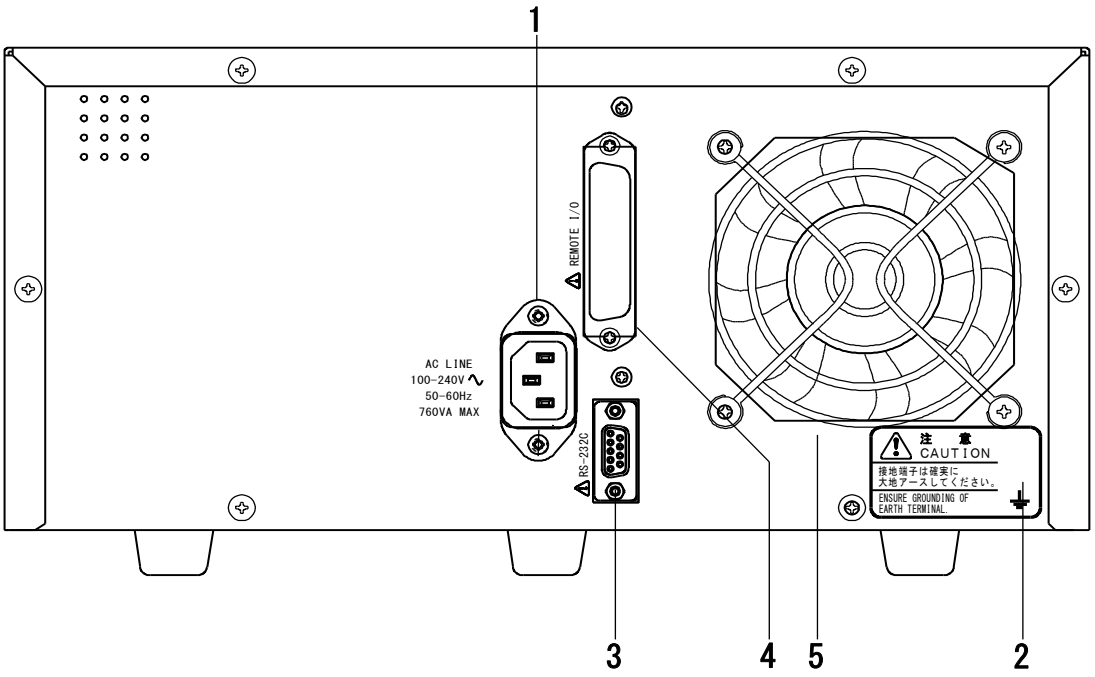


No.	Name	Function description
1	DANGER Lamp	Gives warning lamp when the test voltage is an output. And lights up when power is ON.
2	LOW terminal	Low-voltage side terminal of the test voltage output, the tester case and the same potential.
3	HIGH VOLTAGE terminal	High-voltage side terminal of the test voltage output, the output of the high voltage during the test.
4	Buzzer	Buzzer
5	START switch	Start switch of the test
6	STOP switch	Interruption and judgment return switch of the test.
7	POWER switch	Switch for the power
8	Key cover	Protect the set up key from being touched (option)
9	Set up keys	Key operation possible through the keys in LCD.
10	LCD display	Displays the mode, condition and result.

[LCD Display]

No.	Name	Function description
11	Mode	Display of test mode and operation mode Witstand voltage test : ACW Insulation resistance test: IR Withstand voltage test→Insulation resistance test: ACW-IR Insulation resistance test→Withstand voltage test: IR-ACW Insulation resistance test→Withstand voltage test→Insulation resistance test:IR1-ACW
12	State display	State Stand-by: READY Operation: TEST Judgment: GOOD、HIGH、LOW、HIGH LOW、NG Protect function: PROTECT
13	MEMORY No.	Display of memory No.
14	KEYLOCK	KEYLOCK is dispalyed during this function
15	REMOTE、ONLINE	REMOTE or ONLINE is displayed during these function
16	TEST VOLTAGE	Withstand voltage test Waiting : Setting value of test voltage During test : Measurement output voltage value Judge result: Measurement output value Insulation resistance test Setting of test voltage(1000V/500V)
17	Current, Insulation resistance	Withstand volateg voltage test: Display of current measurement value Insulation resistance test : Display of insulation resistance measurement value
18	TEST TIME	Withstand voltage test Waiting : Setting value of test time During test: Count down till the test end Insulation resistance test Waiting : Setting value of test time During test: Passage time of the test
19	State of RISE/FALL time	Withstand voltage test voltage RISE(/‾\,R),Test time(/‾\ ), voltage FALLtime(/‾\ ,F) are displayed(Automatic)
20	Frequency RANGE	Withstand voltage test Display of the Frequency of the test Insulation resistance test Display of the resistance range of the insulation resistance
21	HIGH	Withstand voltage test Upper setting value of the current Insulation resistance test Upper setting value of the insulation resistance
22	LOW	Withstand volateg test Lower setting value of the current Insulation resistance test Lower setting value of the insulation resistance
23	MASK	Insulation test Display during mask time
24	DISCHARGE	Insulation test Display during discharge
25	Judgment result	Judgment result of each automatic test
26	Setting value of the test volategе	Withstand voltage test Stand-by : Non displayed During test : Setting value of the test voltage Judgment result: Setting value of the test voltage

1.2 Rear panel



No.	Name	Function description
1	AC LINE Connector	Supply power inlet ～：AC symbol
2	⏚	Protective earth terminal. Terminal for earthing the case of the tester with same potential
3	RS-232C Connector	RS-232C interface
4	Remote I/O Connector	Connector for external control
5	Cooling fan	Fan for exhaust

2. Preparation before use

Connection of power cord

1 Make sure that the power switch POWER of this tester is turned off.

2 Connect the power cord to the inlet for the power supply of the rear face.
The plug of the power cord that comes with this tester is for AC100V. If it exceeds AC125V, use the power cord suitable for the rating. 200V type power cord with a plug attached (European 2-pole with earth model name 5880-23-030) is optional.

3 Power cord plug (3P) is connected to the earthed outlet.
The plug of the power cord is 3- pin and the round shaped pin of the center is the earthing.

The power cord plug can be used to disconnect the product from the power line in an emergency. Do not install equipment that makes it difficult to insert and remove the power plug.

⚠Warning Use supply voltage AC100～AC240V (AC90～250V) and power frequency 50-60Hz. Besides, when you connect the power cord, make sure that the power switch is turned off. Beyond this range could lead to the failure and incomplete operation of the tester.

Connection of the protective earth terminal

Earth the protective earth terminal ② to the ground using the supplied earthing wire. When the earthing is imperfect or when the output is short circuited to the ground or power line, the case of the tester is highly charged and it is dangerous to touch it. Besides, when using the tester, be sure to check that the earthing wire is not disconnected.

⚠Warning If the earthing is imperfect, there is a risk of an electric shock.

Method of removing and mounting of key cover (option)

You can mount the key cover (Model 5858-19) to the set up key as an option.
It is used when the set value is not wanted to be processed. As it is fixed with knurled screws, removing and mounting can be done easily with your fingers.

Connection to the external control equipment

External control equipment can be connected to the remote I/O connector ④
Refer to "11.Remote I/O" for connection method.

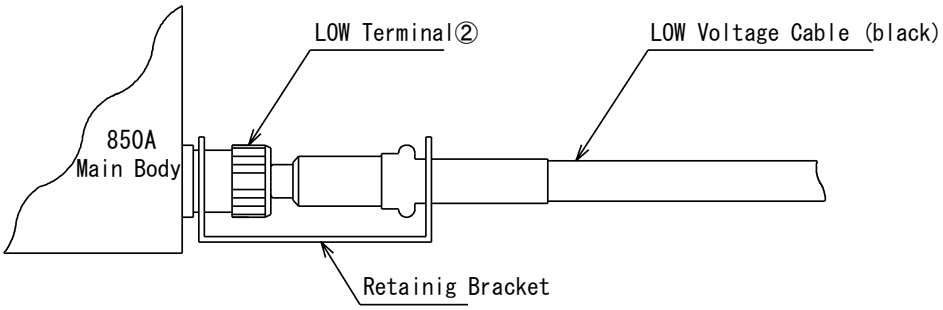
Connection of the high-voltage cable

During the test, the high voltage output terminal is charged to a high voltage. Connect the supplied high voltage cable with the HIGH VOLTAGE terminal ③ and LOW terminal ②. For high voltage cable, use the supplied cable or cable adaptable for the voltage used.

⚠Warning

- Make sure to confirm the power off before connecting the high voltage cable. There is a risk of an electrical shock.
- As the vinyl covering part of alligator clip of the supplied high voltage cable is not a withstand voltage, do not touch during the test. There is a risk of an electric shock.

After connecting the low-voltage side cable to the LOW terminal ②, be sure to secure the retaining bracket to the terminal.



Tighten the low terminal of the main body with the U shaped groove side of the retaining bracket.

⚠Warning

When the low voltage side cable is disconnected,
the whole tested equipment
gets charged with high voltage and there is a risk of an electric shock.

Power on and off

When power switch ⑦ is made ON for the first time after purchase, and if test is started pressing switch ⑤, PROTECTION is activated because of interlock function. Connect the supplied remote I/O connector, to release the PROTECTION.
Use the supplied remote I/O connector only to release the Protect state is released easily.
When the actual test is done, use the interlock function for the safety.
To guard the test area against the electric shock, use the interlock function like cut-off the syat em when the door or cover is opened.

1 Make sure that the power cord, connection cables etc. are connected properly.

2 Press " | " side of POWER switch ⑦ of the front panel to turn it on.

3 After turning on the power switch ⑦, 'Danger lamp test' is blinked for a few seconds. After a few seconds, the display would be on the test mode.

4 Press the "○" side of the POWER switch ⑦ of the front panel to turn it off.

⚠Caution

Do not turn off the POWER switch ⑦ during the test voltage output. This may cause a malfunction. However, it excludes in the state of emergency stop when voltage output does not decrease even when the STOP switch is pressed due to the abnormality of te st sample etc.
Remote IO or RS-232C control is not accepted during the startup screen when the pow er is turned on.
Control after the READY screen is displayed

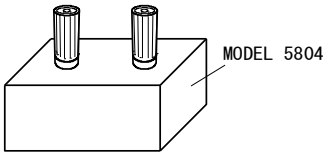
Inspection at test starting（Confirmation of Insulation resistance test)

This procedure is recommended, before stating test.

Necessary resistor

Recommended resistor:　Resistor for the calibration of insulation resistance test (MODEL 5804 series (option) or equivalent resistor.

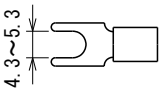
Model No.	Resistant value
5804-11	1MΩ
5804-12	10MΩ
5804-13	100MΩ
5804-14	1000MΩ



Specification of recommended resistor

Max. Circuit voltage	DC1500V
Tolerance	± 1%
Temperature coefficient	± 50ppm/℃ but 1000MΩ ± 100ppm/℃
Terminal connection	Johnson 12mm terminal　Red

Bare crimp terminal: U type Y type 4 to 5 mm



⚠Caution

When using resistor available on the market,

- The resistor may be damaged, if the overload of the rated voltage or current is exceeded.
- It is recommended to use within 50% of the rated power.

Method of confirmation

（1）Prepare resistor

（2）In order to clip the resistor, tighten the bare crimp terminal to the terminal of the resistor.

（3）Set the test voltage 500V, test mode is selected to IR (Insulation resistance)..

（4）To avoid 'NG' judgment, set the lower resistant value lower than tested resistant value, or use timer and set longer mask time.

（5）Connect the test lead to the resistor

（6）Start measurement and confirm that the displayed value is within the accuracy of the resistor for calibration (the accuracy of the tester + the tolerance of the resistor).

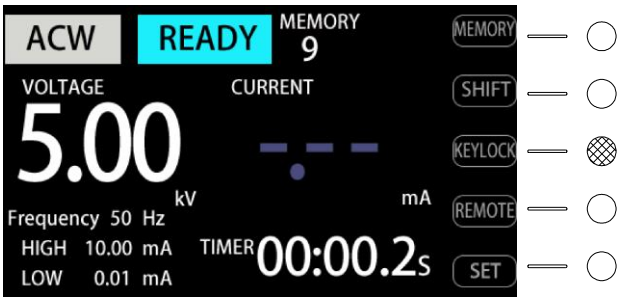
3. Panel operation

Key lock

With this operation, the setting key operation is disabled.
At this time, only START switch and STOP switch are enabled in front panel operation.

Setting of key lock　1）Press ‘KEY LOCK’ key for 3 seconds in the READY state.

READY state



2）KEY LOCK is displayed, and the ‘KEY LOCK’ function is set.

Key lock state

Release of the ’KEY LOCK’　3）Press LOCK key for 3 seconds till KEY LOCK lamp is off.

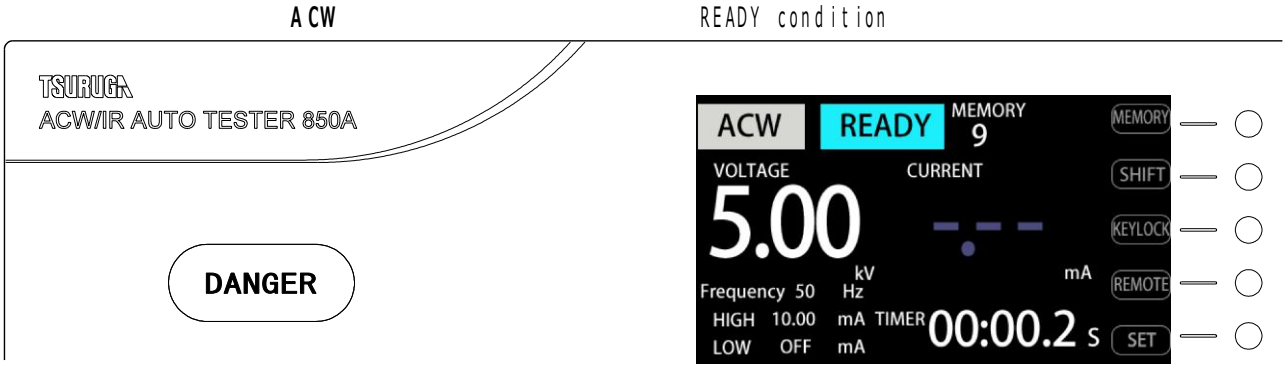
Configuration of the display

The front panel display of this tester can be broadly divided into 3 parts.

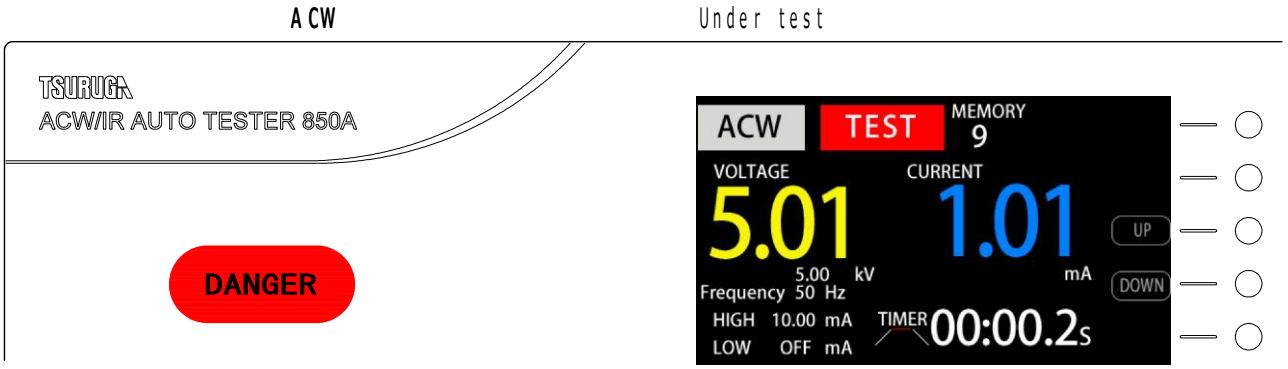
The setting of test conditions can be done according to the memory operation other suitable functions.

Display of READY	Test mode selection and set each setting value
Under test	Memory operation (8. Memory operation)
Judgment Result	Other functions（10. Other settings）

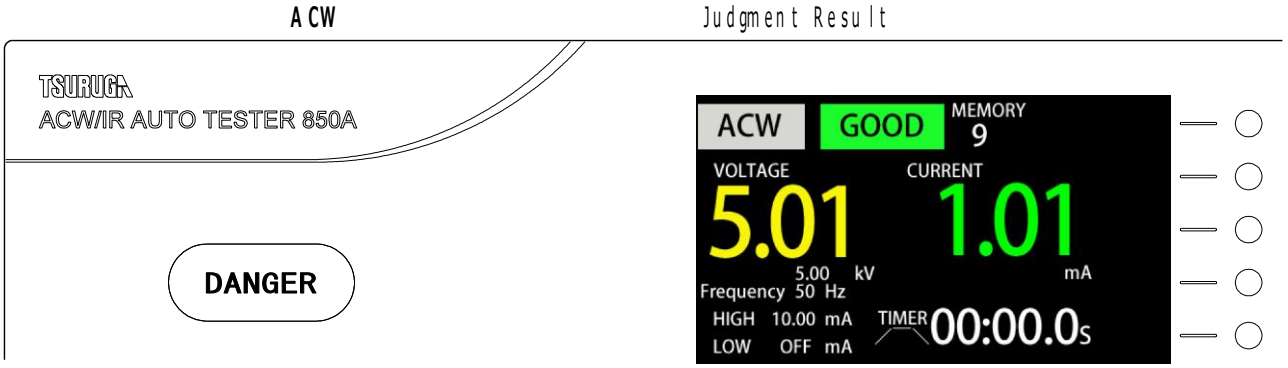
Display of withstand voltage test



'READY' is displayed, when tester is started.



'DANGER' is lighted on, when the value of tested voltage and current are displayed.



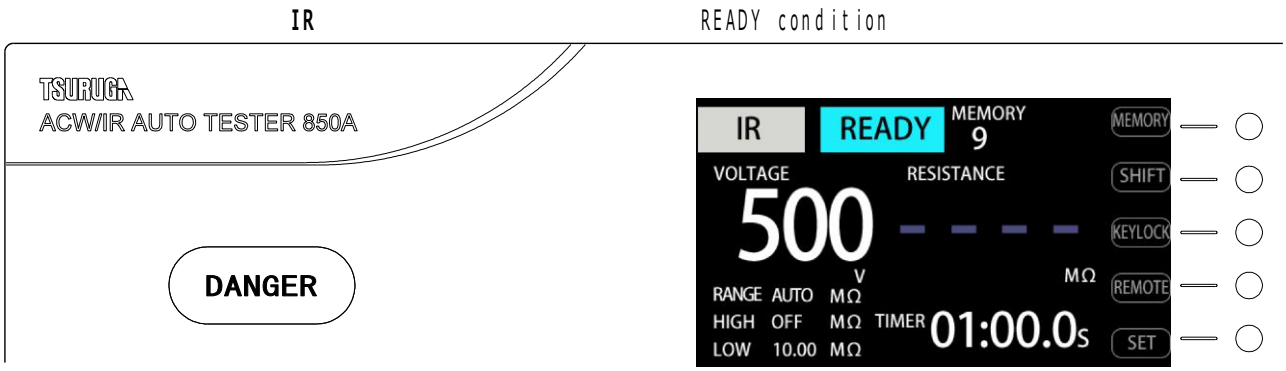
Example of display: 'GOOD' judgment

Press STOP switch to return back to READY status during test and test result.

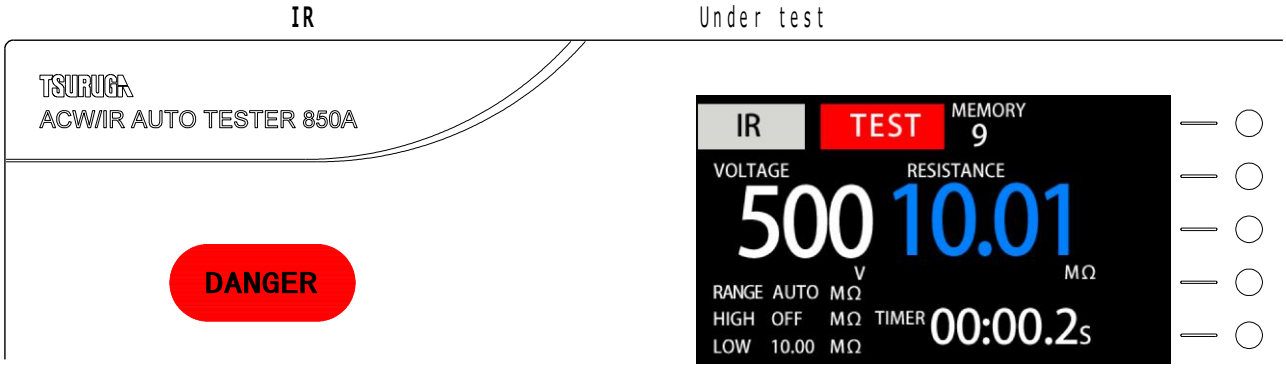
Note） The tested voltage can be adjusted by pressing UP/DOWN key.

Changed setting(test voltage) is recorded after the test without setting memory No.
Setting method: For detail, refer to 6. Setting withstand voltage test (ACW) condition.

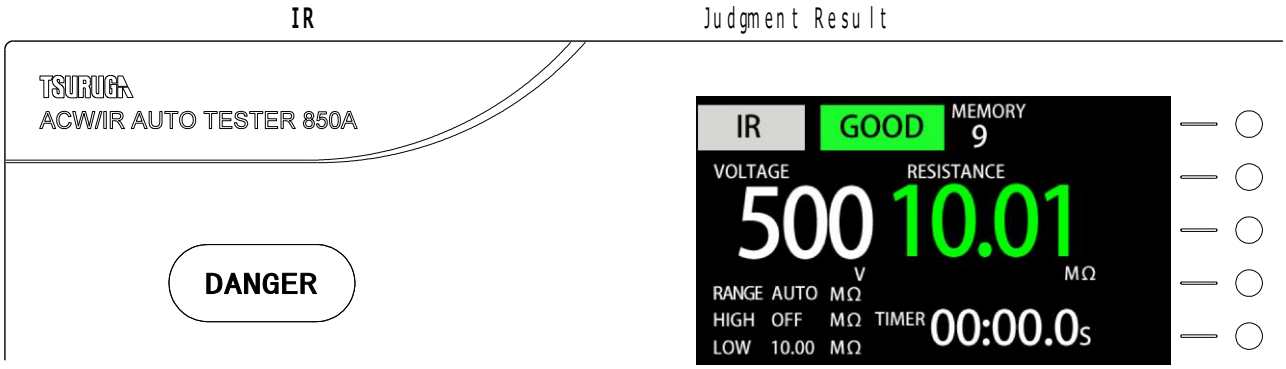
Display of insulation resistance test



'READY' is displayed, when tester is started.



'DANGER' is lighted on, when the value of tested voltage range and the value of insulation resistance are displayed.

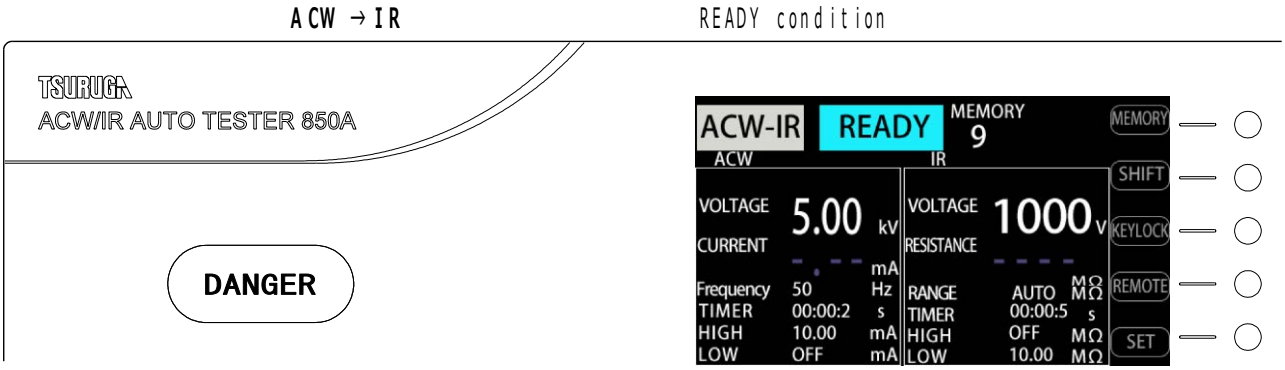


Example of dispaly: 'GOOD' judgment

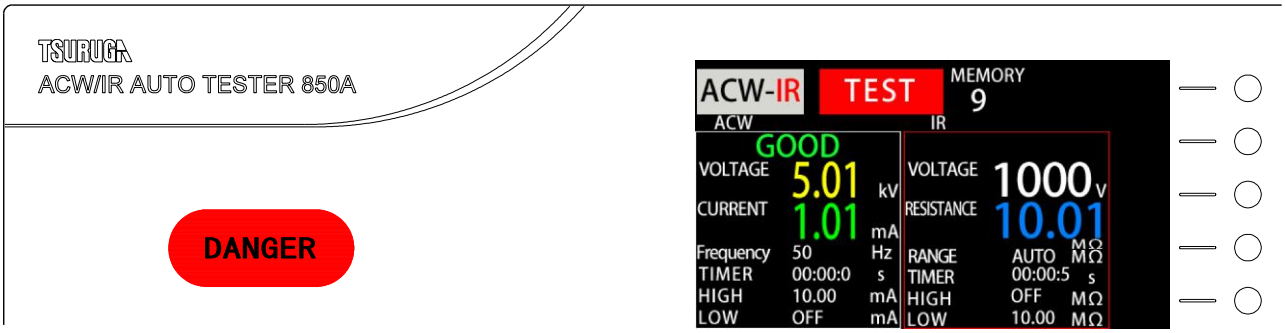
Press STOP switch to return back to READY status during test and test result.

For deatil, refer to 7. Setting of Insulation resistance conditions(IR)

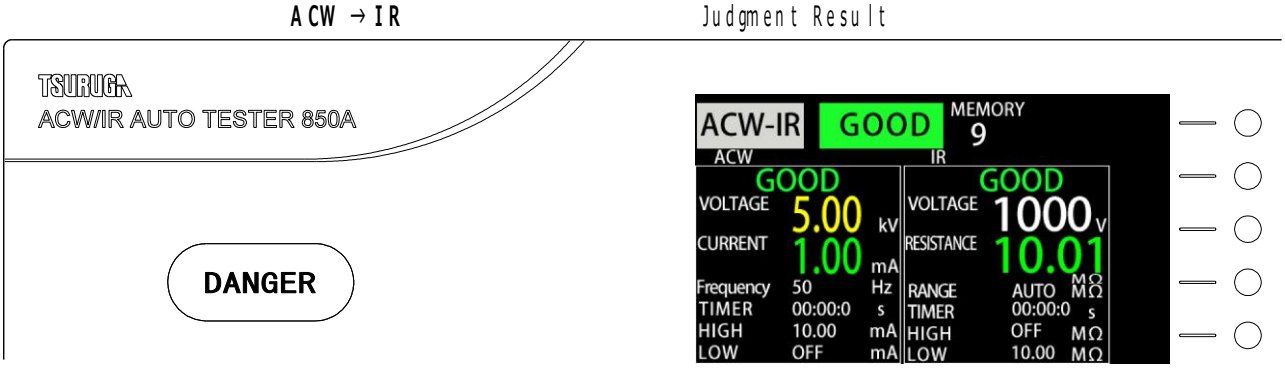
Display of automatic test(withstand voltage test→Insulation resistance test)



'READY' is displayed, when tester is started.



'DANGER' is lighted on, when the value of tested voltage range and insulation resistance are displayed. The item frame under test turns red.

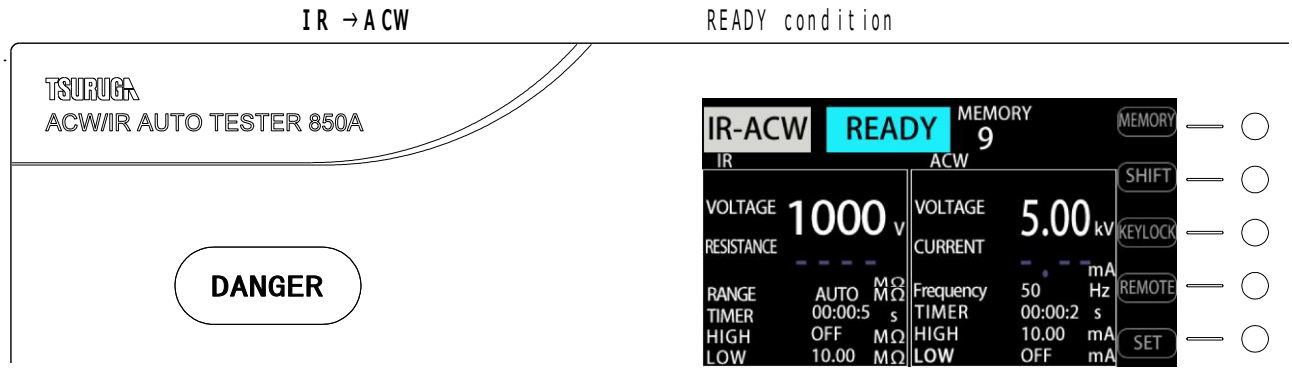


Example of display: When the judgment of both "IR" and "ACW" are good.

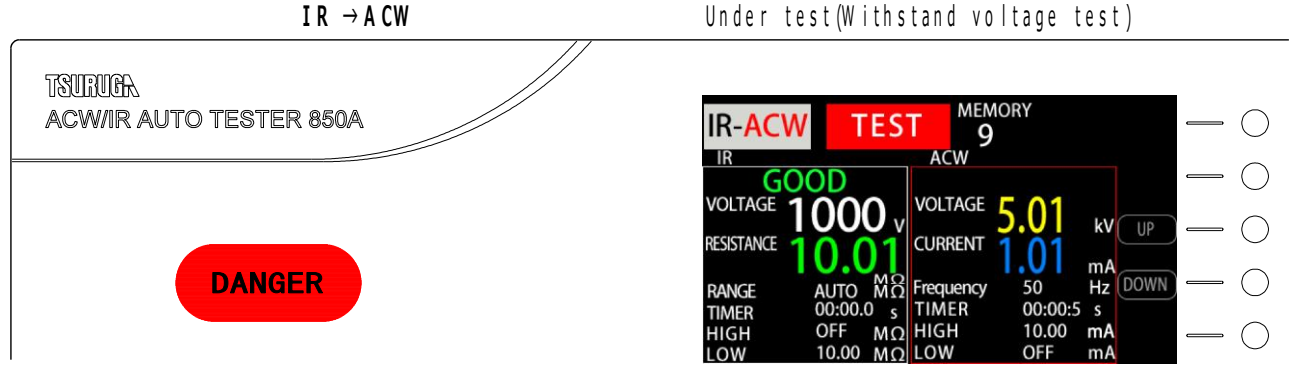
Press STOP switch to return back to READY status during test and test result.

For detail, refer to 4. Setting of Single test and automatic test.

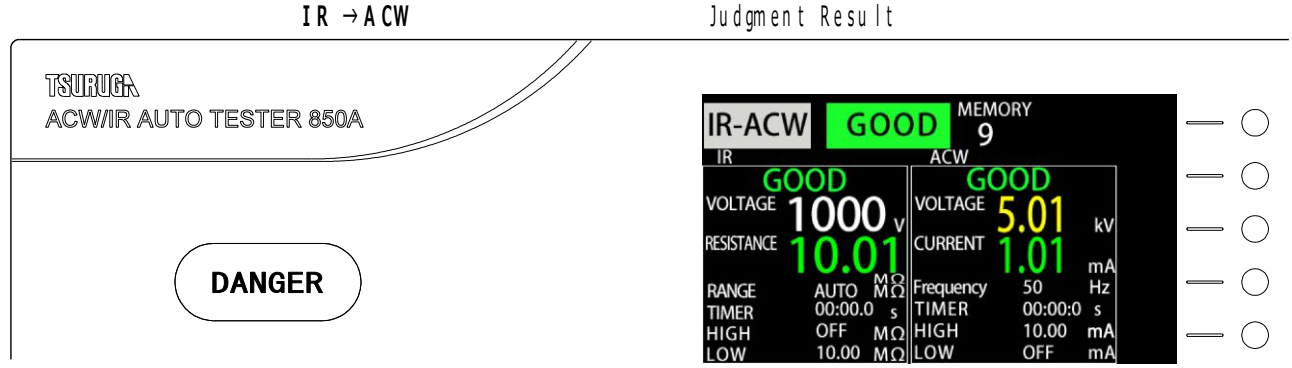
Display of automatic test (Insulation resistance test →withstand voltage test)



'READY' is displayed, when tester is started.



'DANGER' is lighted on, when the value of tested voltage and current are displayed.
The item frame under test turns red.



Example of display: Both 'IR' and 'ACW' are GOOD judgment.

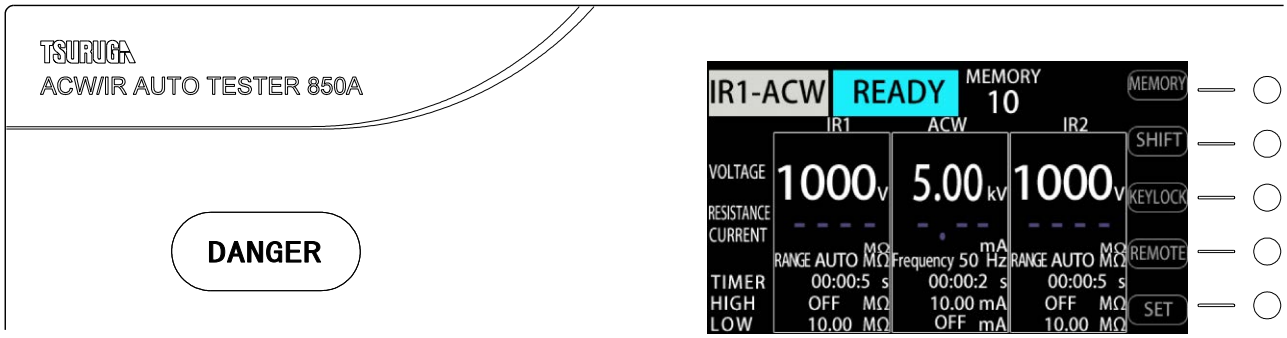
Press STOP switch to return back to READY status during test and test result.

For detail, refer to 4. Setting of Single test and automatic test.

Display of automatic test (Insulation resistance test →withstand voltage test→Insulation resistance test)

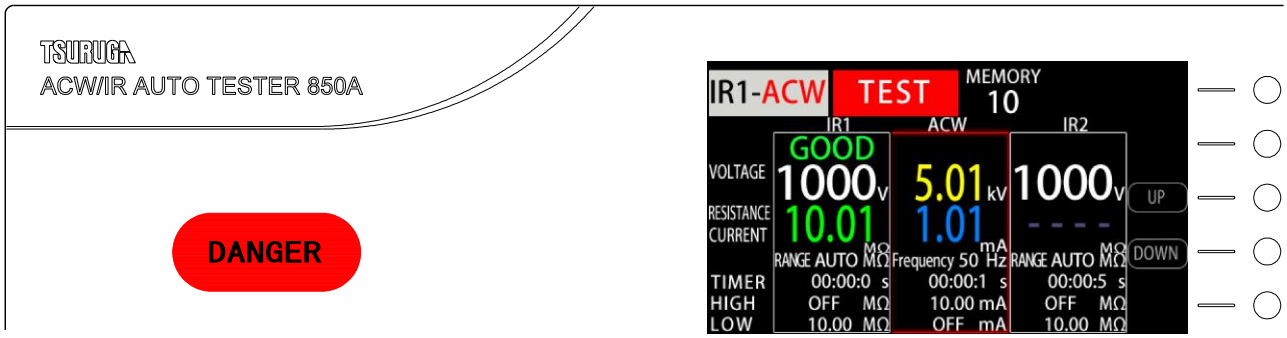
For memory No. 10, it is automatic test IR1-ACW-IR2 fixed.

IR1 →ACW →IR2 READY condition



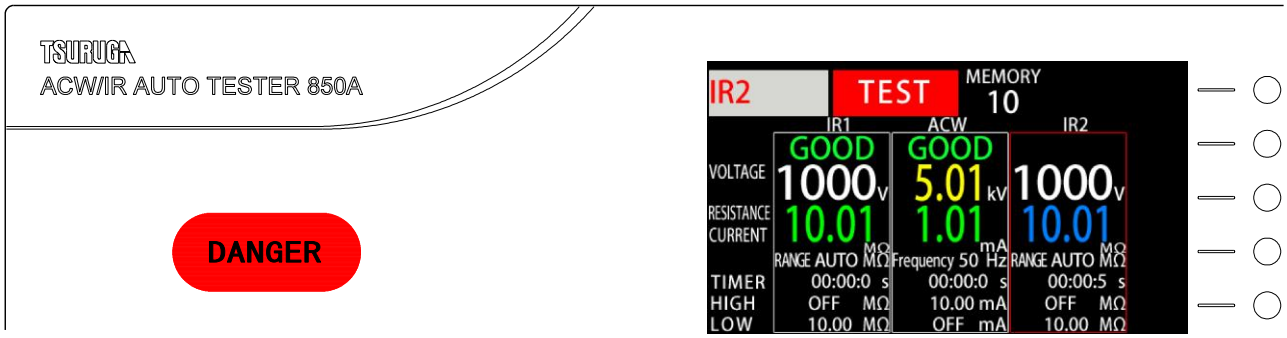
'READY' is displayed, when tester is started.

IR1 →ACW →IR2 Under test(Withstand voltage test)



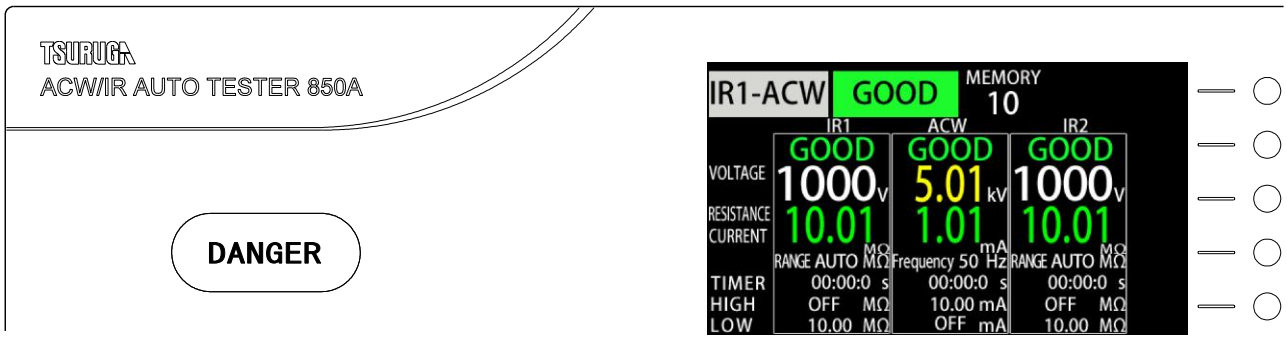
'DANGER' is lighted on, when the value of tested voltage and current are displayed.
The item frame under test turns red.

IR1 →ACW →IR2 Under test(Insulation resistance test)



'DANGER' is lighted on, when the value of tested voltage range and insulation resistance are displayed.
The item frame under test turns red.

IR1 →ACW →IR2 Judgment Result



Example of display: Both 'IR1' , 'ACW'and 'IR1' are GOOD judgment.

Press STOP switch to return back to READY status during test and test result.

Expression of the panel display of setting operation

⚠Caution

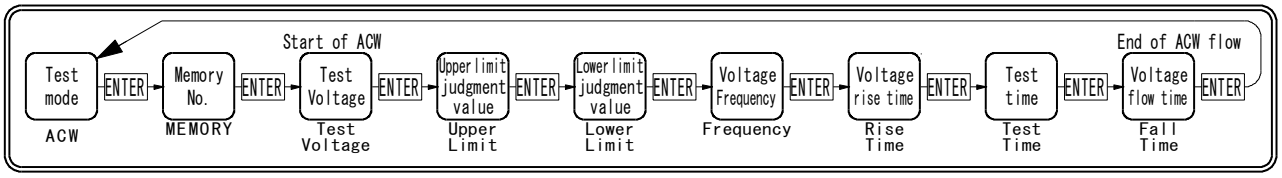
During setting, if key is not operated for about five minutes, it automatically returns to READY state. During this time the contents changed will not be stored.
Setting values must be within the range, if over-range values are set, display can not moved to forward (pressing ENTER) or backward (pressing EXIT).

Flow of each test setting

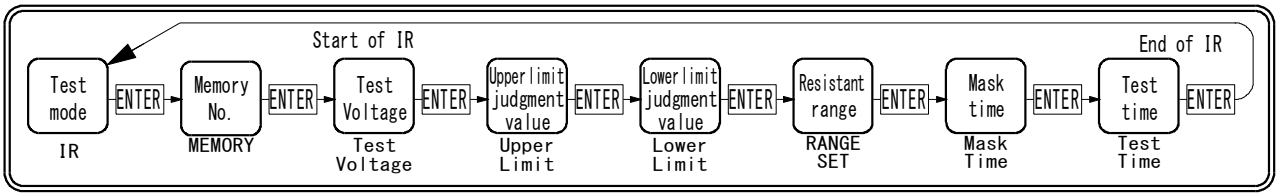
Press STOP switch to return back to READY status during test and test result.

Entering setting mode	:During 'READY' state, press 'SET' key for more than 1 sec.
End of setting	:Pressing 'EXIT' key for more than 1 sec., the value is saved and other status is returned to 'READY' state.
Cancellation of setting	:If 'SHIFT' and "EXIT" are pressed simultaneously for more than 1 sec., the operation is interrupted and changed to 'READY' state, enabling the next test operation.

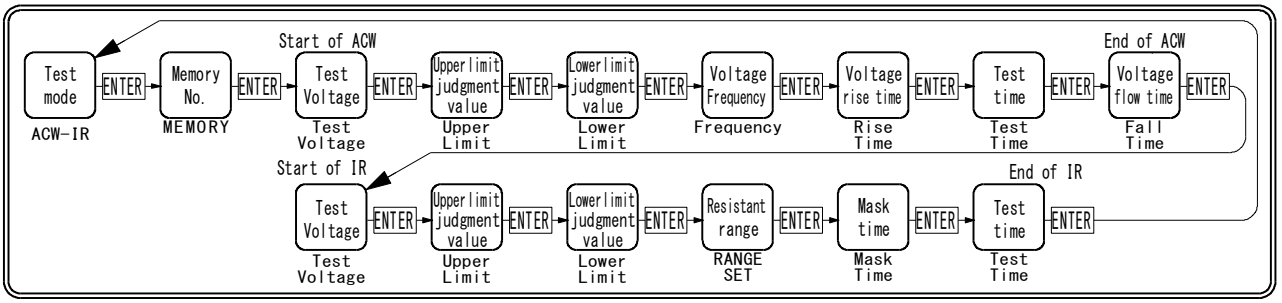
Setting flow of ACW



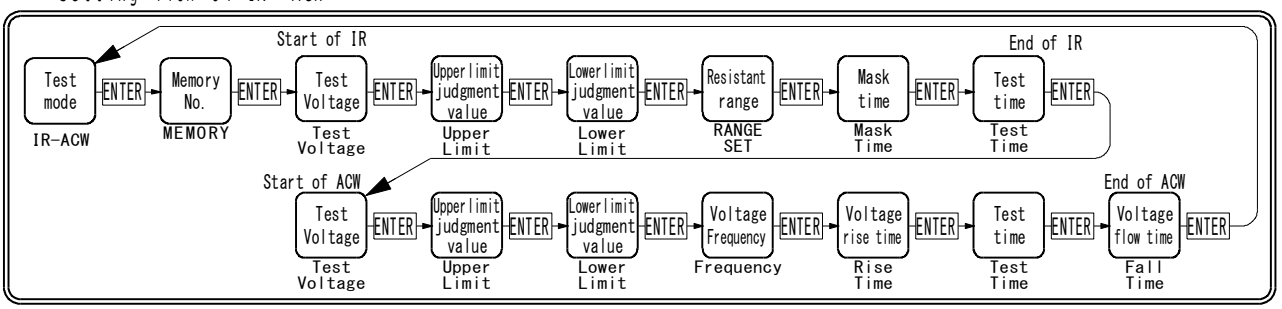
Setting flow of IR



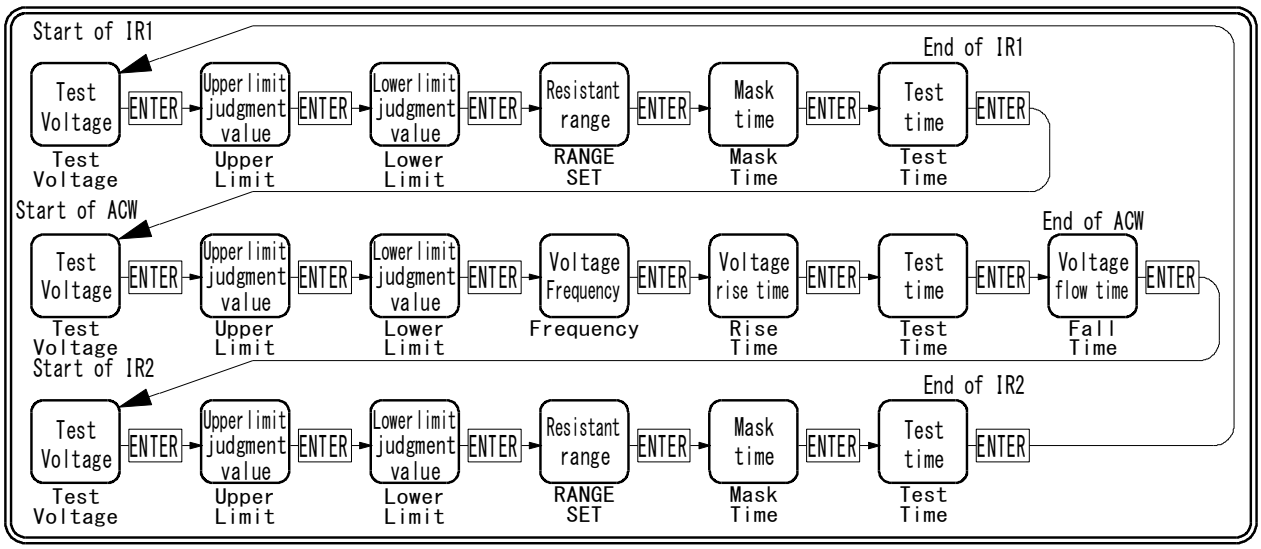
Setting flow of ACW→IR



Setting flow of IR→ACW



Setting flow of IR1→ACW→IR2(Memort No.10)



When the memory number is 10, the test mode and memory number cannot be set.
If there is no memory number, the memory number cannot be set.
However, if there is no memory number after memory number 10,The test mode cannot be set.

4. Setting of Single test and Automatic test

Types of test

This tester has a single test and an automatic test.

1)Single test

・Withstand voltage test (ACW)

・Insulation resistance test (IR)

2)Automatic test

The withstand voltage test and insulation resistance test are switched to each other automatically and the test is carried out continuously. 。

・Switch to insulation resistance test from withstand voltage test (ACW-IR)

・Switch to withstand voltage test from insulation resistance test (IR-ACW)

・In case of memory No. 10, switching insulation resistance test, withstand voltage test and insulation resistance test (IR1-ACE-IR2) takes place.
After insulation resistance test and withstand voltage test, insulation resistance test is carried out again in order to find out if the specimen is damaged by withstand voltage test.
The test can be conducted with the last setting of insulation resistance test which may be different from the first insulation resistance test setting.

Selection of test mode

・The test mode of single test like ACW or IR and automatic like ACW-IR or IR-ACW can be set.

・Setting range　Memory No.1-9

ACW(Withstand voltage test) ,
IR(Insulation resistance test),
ACW-IR(Withstand voltage test→Insulation resistance test),
IR-ACW (Insulation resistance test→Withstand voltage test)

Note: Memory No. 10 is fixed for IR-ACW-IR auto test.

Entering setting mode

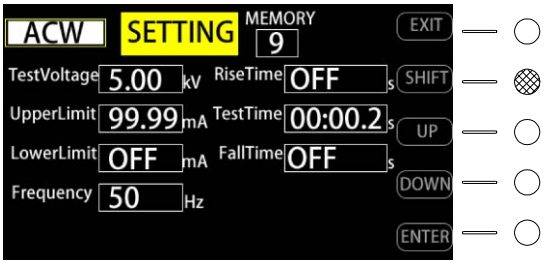
1) At the 'READY' status, press 'SET' for more than 1sec.

Select test mode

・Display is changed to 'SETTING'mode.

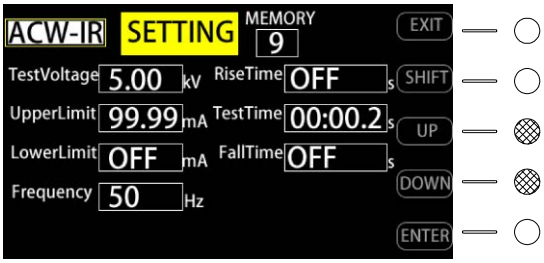
2) Selection of test mode by pressing 'ENTER'Select test mode

(The yellow frame shows the test mode is selected.)



3) Press 'SHIFT' key, test mode is converted to reverse display.

Change of test mode



4) Select the desirable test mode by pressing 'UP' or 'DOWN' key.

End of setting　Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

5. Setting of Memory No.

Selecting of memory No.

・Max.10 sets of test conditions can be memorized

・Select the memory No. Of test condition

・Setting range 1－9

Note: Memory No.10 is fixed for IR-ACW-IR auto test.
Memory No. can not be set during REMOTE mode.

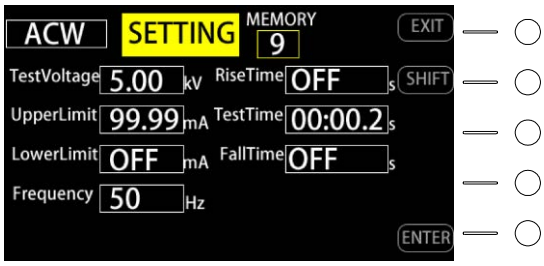
Entering setting mode

1) At the 'READY' status,Press 'SET' for more than 1sec.

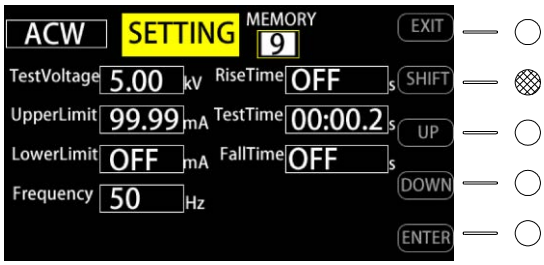
Select memory No.

・Display is changed to 'SETTING'mode.

2） Selection of test mode by pressing 'ENTER'Select memory No.

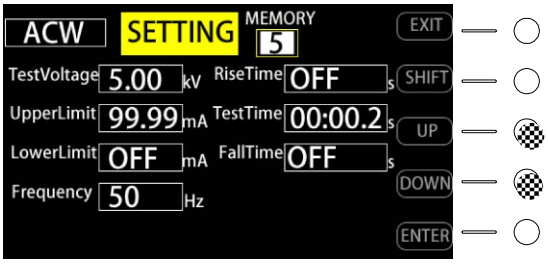


(The yellow frame shows the memory No. is selected.)



3) Press 'SHIFT' key, memory No. is converted to reverse display.

Change of Menory No.



4) Select the desirable memory No. by pressing 'UP' or 'DOWN' key.

End of selection

Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

6. Setting of Withstand voltage test (ACW)

Setting of test voltage

・The withstand voltage test condition of Single test ACW, Automatic test ACW-IR, IR-ACW can be selected.

・Set the test voltage

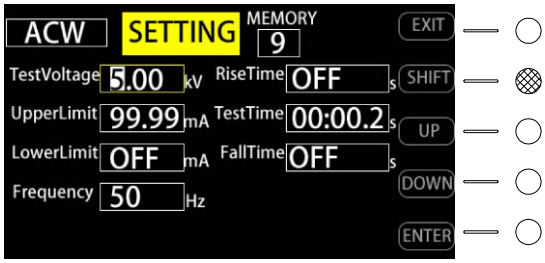
・Setting range 0.00kV - 5.50kV

Entering Setting mode

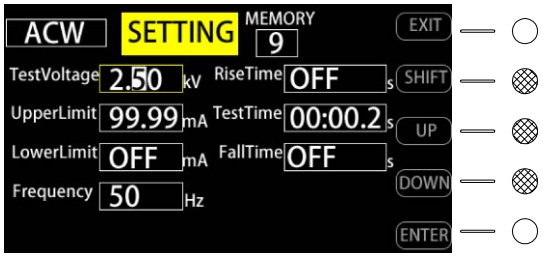
1) At the 'READY' status, press 'SET' for more than 1sec.

・Display is changed to 'SETTING'mode. (The yellow frame shows the test voltage is selected.)

Set test voltage



2) Press 'SHIFT' key, test Voltage is converted to reverse display.



3) Select the desirable test mode by pressing 'UP' or 'DOWN' key.

End of setting

Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

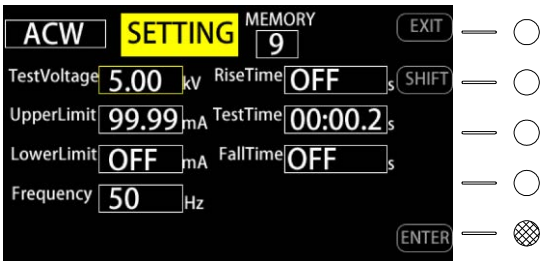
Upper limit judgment value

・The upper limit of current can be set.

・Setting range 0.05 - 99.99mA

Entering setting mode

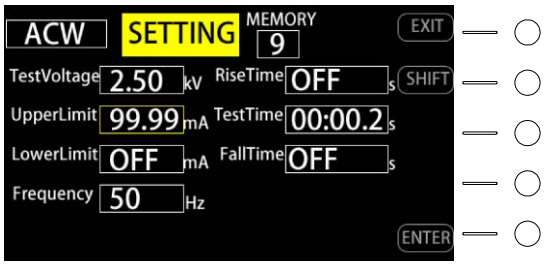
1) At the 'READY' status, press 'SET' for more than 1sec.



・Display is changed to 'SETTING' mode.

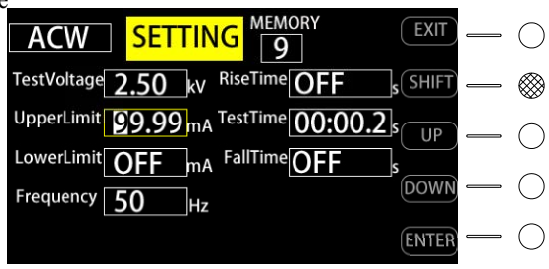
2) Selection of Upper limt

Selection of upper limt judgment value by pressing 'ENTER' key.



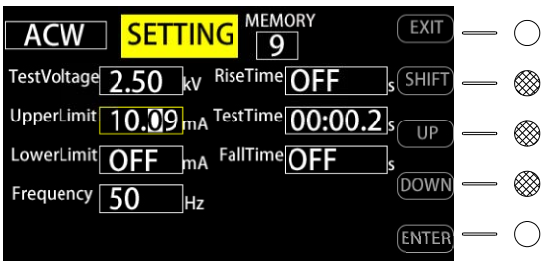
(The yellow frame shows the Upper limit value selected.)

Set upper limit judgment value



3) Press 'SHIFT' key.

Setting value of 'Upper Limit value' is converted to reverse display.



4) Select the desirable test mode by pressing 'UP' or 'DOWN' key.

End of setting

Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Lower limit judgment value

- The lower lmit judgment value of current can be set. When setting is not required, set OFF.
- When voltage uprising or downfall, the judgment of the lower limit judgment is not done.
- Setting range 0.01—50.00mA and 'OFF'

Entering setting mode

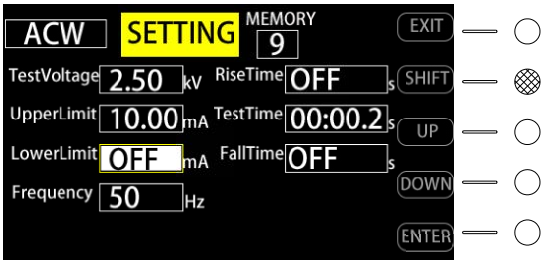
1) At the 'READY' status, press 'SET' for more than 1sec.

・Display is changed to 'SETTING'mode.

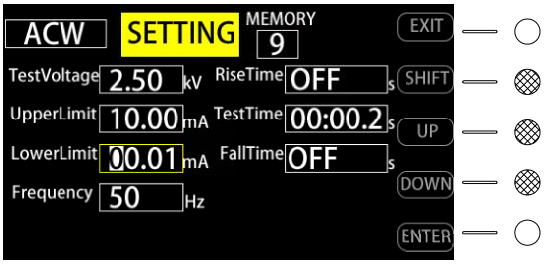
2) Selection of Lower limt
Selection of lower limt judgment value by pressing 'ENTER' key.

(The yellow frame shows the Lower limit value is selected.)

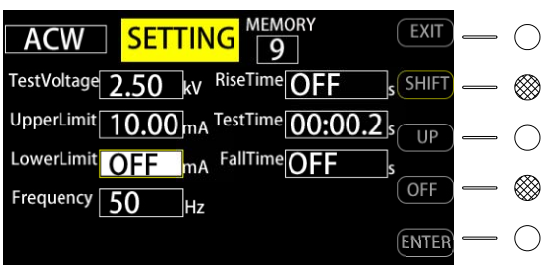
Set lower limit judgment value



3) Press 'SHIFT' key.
Setting value of 'Lower Limit' is converted to reverse display.



4) Select the desirable value by pressing 'UP' or 'DOWN' key. If 'OFF' is set, Number setting can be done by using 'UP' or 'DOWN'key.



5) Selecting 'OFF'
Keep pressing 'SHIFT', press 'OFF'.
(the display of 'DOWN' key is changed to 'OFF' display)

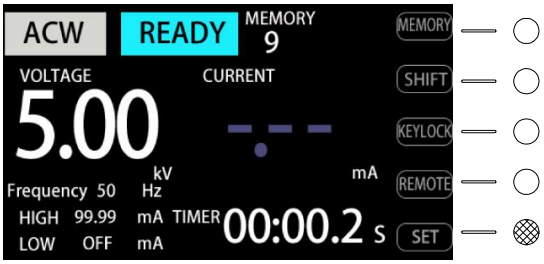
End of Setting Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Setting of test voltage frequency

・Set the frequency of test voltage

・Frequncy range can be set 50Hz or 60Hz

Entering setting mode



1) At the 'READY' status, press 'SET' for more than 1sec.

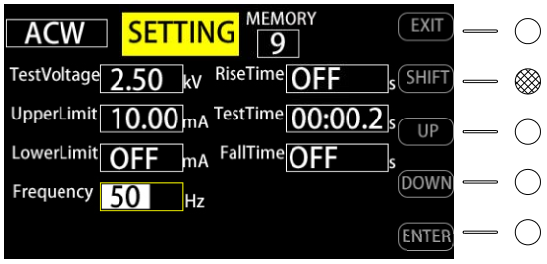
・Display is changed to 'SETTING' mode.

2) Selection of Frequency

Selection of frequency by pressing 'ENTER' key.

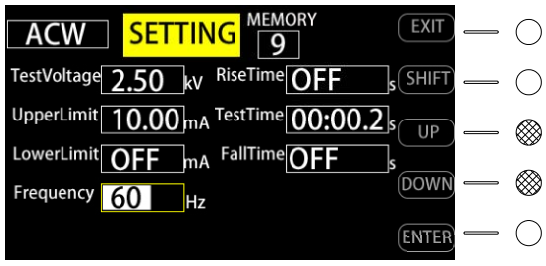
(The yellow frame shows the Frequency is selected.)

Set frequency



3) Press 'SHIFT' key.

Setting value of 'Frequency' is converted to reverse display.



4)Frequency is adjusted by pressing 'UP' or 'DOWN' keys.

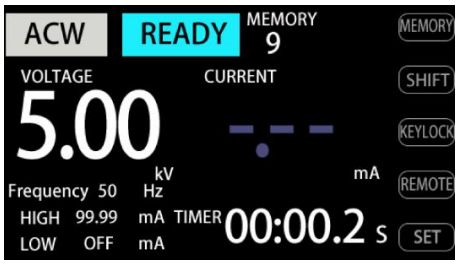
End of Setting

Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Setting of the voltage rise time

- Voltage rise time is set till it reaches the test voltage value.
- During the voltage rise, the lower limit judgment of current is not performed.
- Setting range 0min.00.1sec.—1 min.59.9sec./OFF

Entering setting mode



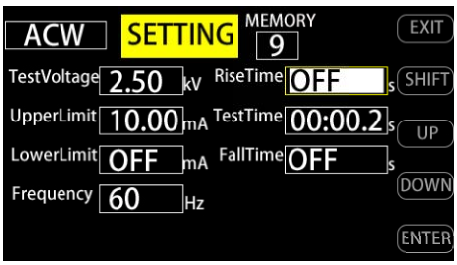
1) At the 'READY' status, press 'SET' for more than 1sec.

・Display is changed to 'SETTING' mode.

2) Selection of Rise time
Selection of voltage rise time by pressing 'ENTER' key.

(The yellow frame shows the Rise time is selected.)

Set voltage rise time



3) Press 'SHIFT' key.
Setting value of 'Rise time' is converted to reverse display.

4) Select the digit by pressing 'SHIFT' key, and Rise time is changed by 'UP' or 'DOWN' key. If 'OFF' is set, number setting can be done by using 'UP' or 'DOWN'key.

5) Selecting 'OFF'
Keep pressing 'SHIFT', press 'OFF'. (the display of 'DOWN' key is changed to 'OFF'display)

End of setting Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Setting of the test time

・Setting range　00min.00. 2 sec.—99min.59.9sec. and OFF

・If the test time is set, timer display counts down during the test.

・If the test time is put OFF, the timer display counts up from the test start.
If it exceeds 99min.59.9sec.,　"--:--. -" is displayed and test continues till NG judgment or stop.

Entering setting mode

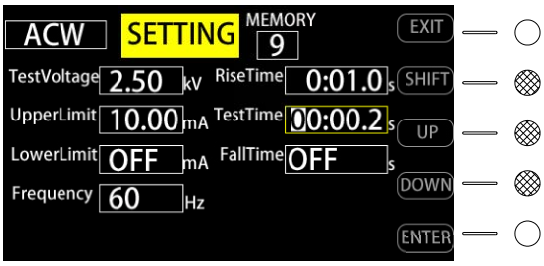
1)At the 'READY' status, press 'SET' for more than 1sec.

・Display is changed to 'SETTING'mode.

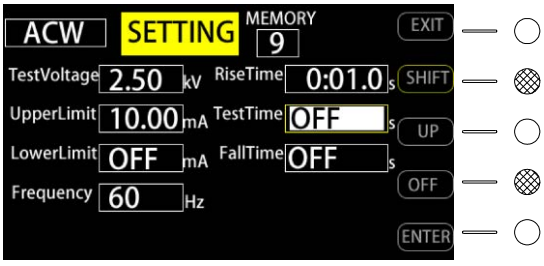
2)Selection of 'Test time'
Selection of test time by pressing 'ENTER' key.

(The yellow frame shows the test mode selected.)

Set 'Test Time'



3)Press 'SHIFT' key.
Setting value of 'Test time' is reverse display.
4)Select digit by pressing 'SHIFT' key and set the value using 'UP' or 'DOWN' key.
If 'OFF' is set, number setting can be done by using 'UP' or 'DOWN'.



5) Selecting 'OFF'
Keep pressing 'SHIFT', press 'OFF'. (the display of 'DOWN' key is changed to 'OFF' display)

End of Setting

Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Setting of the voltage fall time

・Fall time of the test voltageis set.
・During the voltage fall, the lower limit judgmentof current is not performed.
・Setting range　0min. 00.1sec.—1min.59.9sec. and OFF

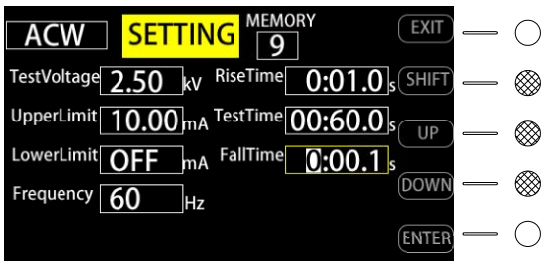
Entering setting mode

1)At the ‘READY’ status, press ‘SET’ for more than 1sec.

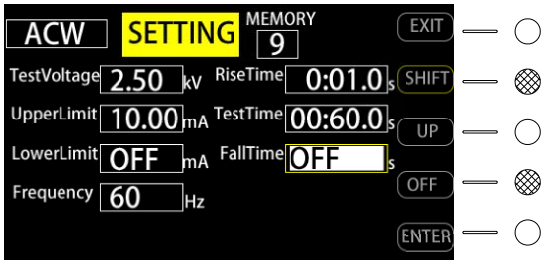
・Display is changed to ‘SETTING’ mode.
2)Selection of ‘Fall time’
Selection of fall time by pressing ‘ENTER’ key.

(The yellow frame shows the test mode elected.)

Set voltage fall time



3) Press ‘SHIFT’ key.
Setting value of ‘Test time’ is reverse display.
4)Select digit by pressing ‘SHIFT’ key and set the value using ‘UP’ or ‘DOWN’ key.
If ‘OFF’ is set, number setting can be done by using ‘UP’ and ‘DOWN’.



4)Selecting ‘OFF’
Keep pressing ‘SHIFT’, press ‘OFF’.
（the display of ‘DOWN’ key is changed to ‘OFF’ display）

End of Setting　Press ‘EXIT’ key for more than 1sec., the set value is saved. The display is returned to READY status.

7. Setting of Insulation resistence test(IR)

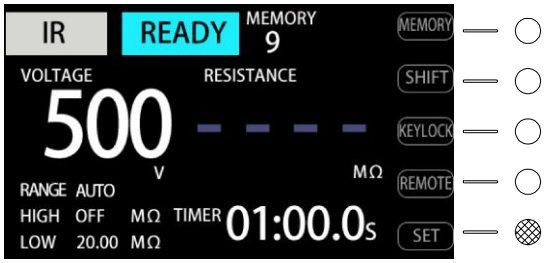
Setting of test volatge

・Set a single test IR, automatic test ACW-IRand insulation resistance test conditions in IR-ACW.

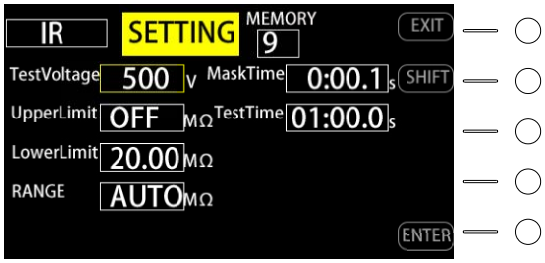
・Set the test voltage.

・Setting range　500V/1000V

Entering setting mode

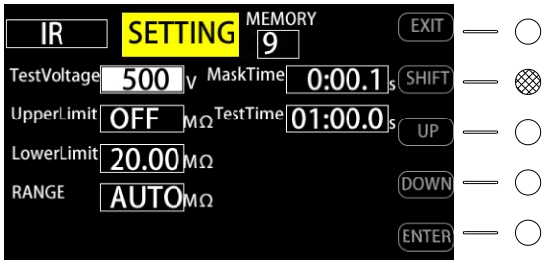


1)　At the 'READY' status, press 'SET' for more than 1sec.

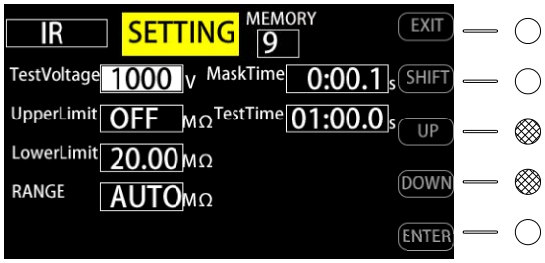


・Display is changed to 'SETTING'mode. The yellow frame shows the test mode is selected.

Set test voltage



2)　Press 'SHIFT' key.
Setting value of 'Test voltage' is converted to reverse display.



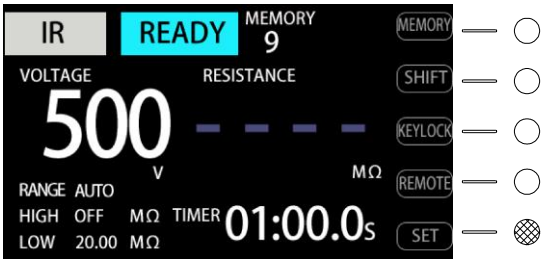
3) Select digit by pressing 'SHIFT' key and set the value using 'UP' or 'DOWN' key.

End of Setting　Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

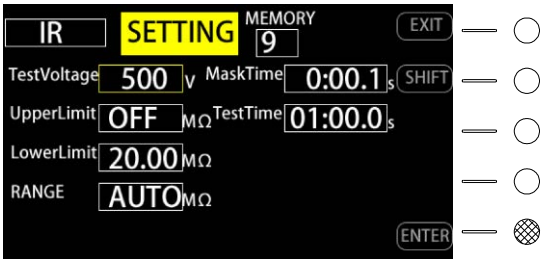
Upper limit judgment value

・The upper judgment value of the insulation resistance can be set.
During Mask-time, no judgment is done.
・Setting range: Range Setting area
20.00MΩ : 0.01－99.99 MΩ and OFF
200.0MΩ : 0.1－999.9 MΩ and OFF
2000MΩ : 1－9999 MΩ and OFF

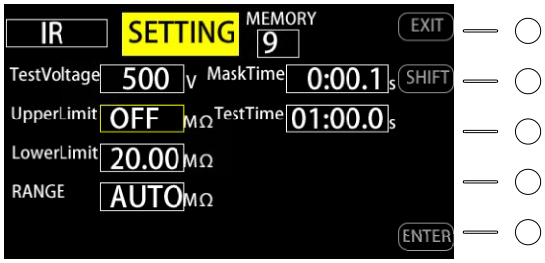
Entering setting mode



1) At the 'READY' status, press 'SET' for more than 1sec.

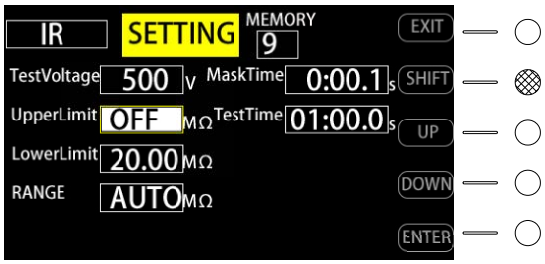


Display is changed to 'SETTING' mode.
2)Selection of 'Upper Limit'.
Select test mode, by pressing 'ENTER'

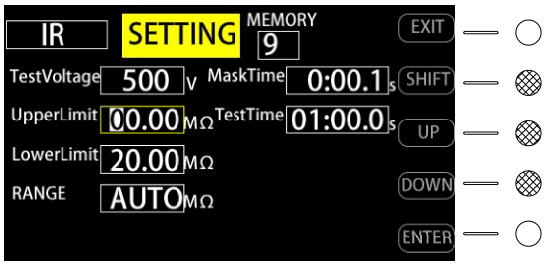


(The yellow frame shows the test mode) selected.)

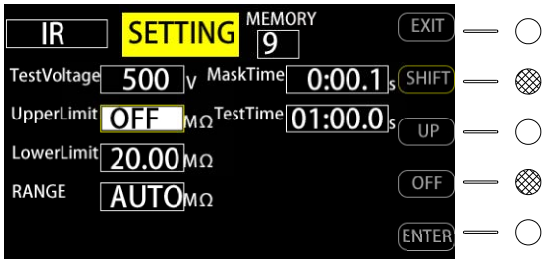
Set upper limit judgment



3)Press 'SHIFT' key
Setting value is reverse display.



4)Press 'SHIFT' key to select 'digit'..
The value of 'Resistance range' can be set by using 'RANGE' key and 'Upper limit value' by using 'UP' key.
If 'OFF' is set, the display is changed to number setting by pressing 'UP'.



5)Selecting 'OFF'
Keep pressing 'SHIFT', press 'OFF'.
(the display of 'DOWN' key is changed to 'OFF')

End of Setting Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Lower limit judgment value

・The lower judgment value of insulation resistance can be set.
During mask-time, no judgment is done.

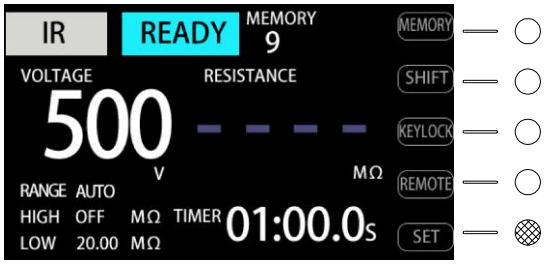
・Setting range: Range Setting area

20.00MΩ : 0.01—99.99 MΩ

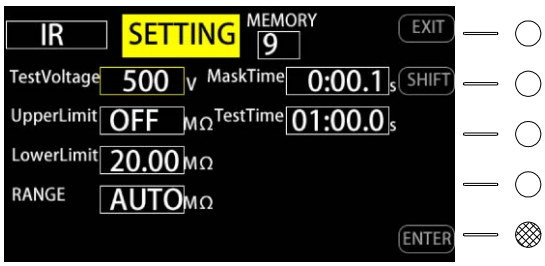
200.0MΩ : 0.1—999.9 MΩ

2000MΩ : 1—9999 MΩ

Entering setting mode



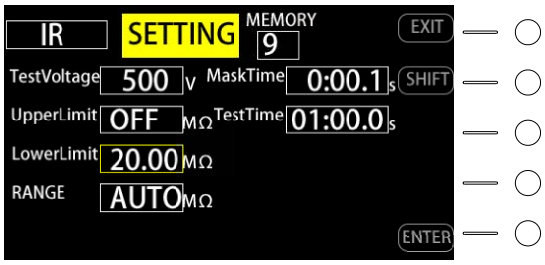
1) At the 'READY' status, press 'SET' for more than 1sec.



Mode display is changed to 'SETTING'

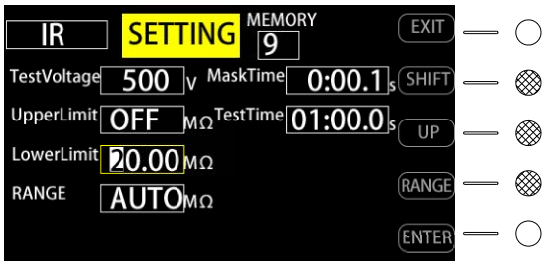
2) Selecting 'Lower Limit'

By pressing 'ENTER' key, select the 'Lower Limit'



(The yellow frame shows the test mode)

Set lowerlimit judgment value



3) Press 'SHIFT' key.
The value is converted to reverse display.

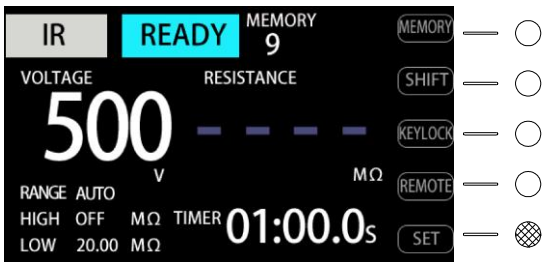
4) Select digit by pressing 'SHIFT' key and set the resistance range by using 'RANGE' and lower judgment limit by 'UP' key.

End og Setting Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

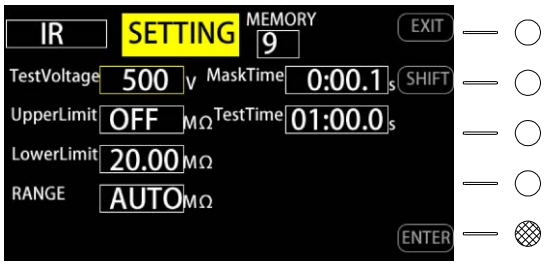
Setting of the resistance range

- The resistance range can be set.
- Setting resistance range　20.00MΩ, 200.0MΩ, 2000MΩ, AUTO

Entering setting mode



1) At the 'READY' status, press 'SET' for more than 1sec.

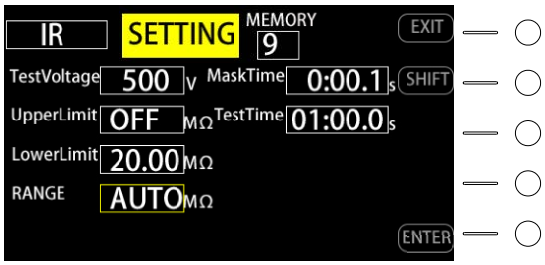


Mode display is changed to 'SETTING

2)Select 'Resistance range'

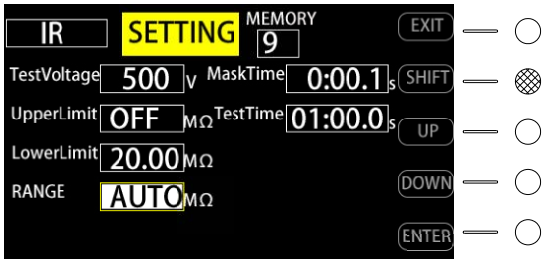
By pressing 'ENTER' key ,

select the 'Resistance range'.



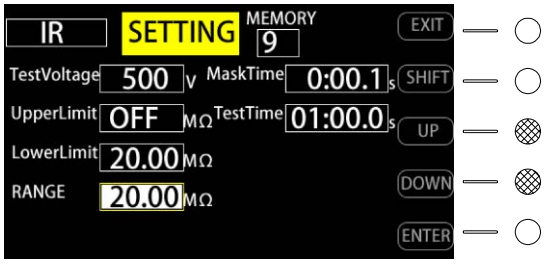
(The yellow frame shows the test mode)

Set the resistance range



3)　Press 'SHIFT' key.

Setting value of the resistance value displayed in 'RANGE' frame is converted to reverse display.



4)　Set the resistane range by using 'UP' or 'DOWN' key

End of Setting　　Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

Setting of mask time

・It is a timer to prohibit the judgmentfrom the start of the test for a certain period of time.

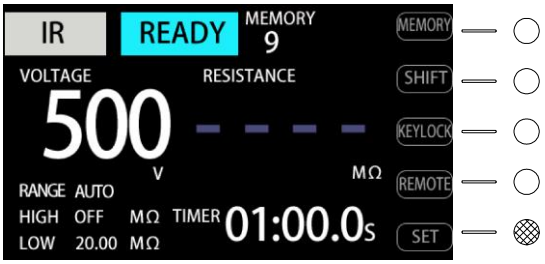
・'Mask Timer' is displayed when the timer is activated.

It is used when the waiting time is important for the measurement of test specimen which has delay like capacitive load etc.

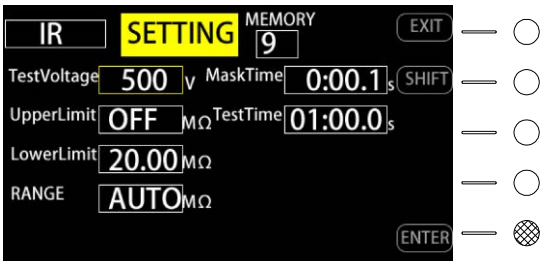
・Setting range　0min.00.1－1min.59.9sec.　Not possible during OFF.

Setting of Mask time＜Test time

Entering setting mode



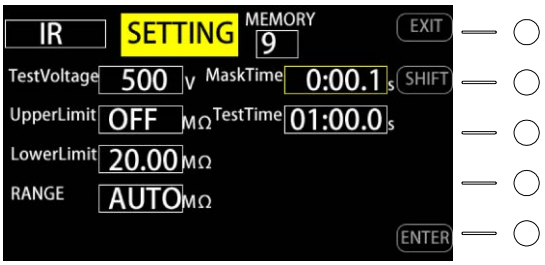
1) At the 'READY' status, press 'SET' for more than 1sec.



Mode display is changed to 'SETTING'.

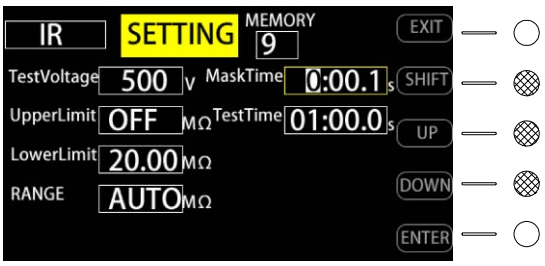
2)Selection of 'Mask Time'

By pressing 'ENTER' key, select the 'Mask Time'



(the frame of 'Mask Time' is changed in yellow color.)

Set mask time



3)Press 'SHIFT' key.

The value of 'Mask Time' is converyed to reverse display.

4)Select digit by pressing 'SHIFT' key and set the Mask Time value by using 'UP' or 'DOWN' key.

End of Setting

Press 'EXIT' key for more than 1sec., the set value is saved. The display is returned to READY status.

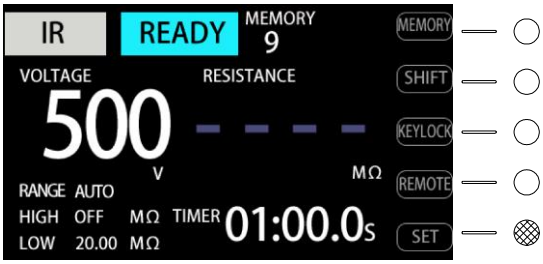
Setting of test time

・Set the test time

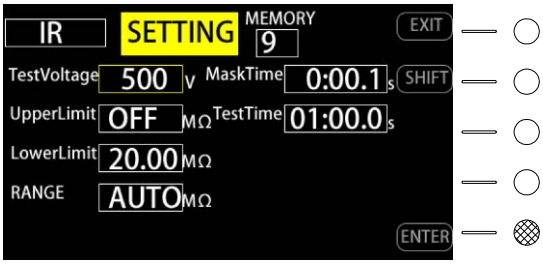
・Setting range　00 min.00.2－99 min.59.9 sec.

Mask Time＜Test Time

Entering setting mode

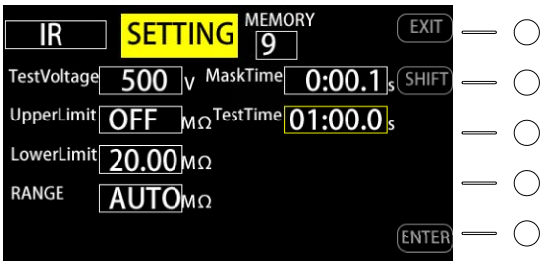


1) At the ‘READY’ status, press ‘SET’ for more than 1sec.



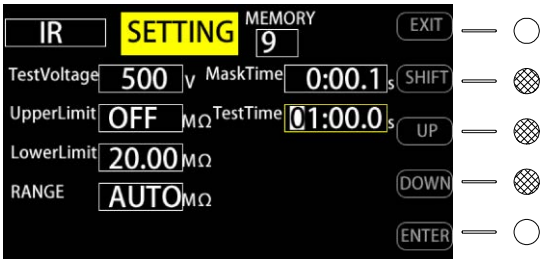
・Mode display is changed to ‘SETTING’.

2) Select ‘Test Time’, by pressing ‘ENTER’ key, select the ’Test Time’.



(the frame of ‘Test Time’ is changed in yellow color.)

Set Test Time



3）Press ‘SHIFT’ key.
The ‘Test Time’ is converted to reverse displayed.

4）Select digit by pressing ‘SHIFT’ key and set the Test Time’ by using ‘UP’ or ‘DOWN’ key.

End of Setting　Press ‘EXIT’ key for more than 1sec., the set value is saved. The display is returned to READY status.

8. Memory operation

Overview

・The test conditions up to maximum 10 pairs can be memorized in the internal memory.

・The memorizedcontent can be called by an external control and remote control.

Test condition that can be stored

Setting items	Test condition
Test mode	ACW → IR IR → ACW ACW IR IR1 →ACW →IR2 (Memory No.10) } Any one
Memory No.	1-10
Withstand voltage test ACW	Test voltage Upper limit judgment value Lower limit judgment value The frequency of the test voltage Voltage rise time Test time Voltage fall time
Insulation resistance test IR	Test voltage Upper limit judgment value Lower limit judgment value Resistance rage Mask time Test time

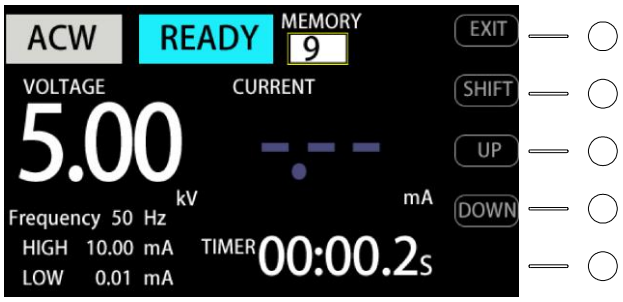
Call of memory

Call of memory

Press STOP switch to return to READY state during rest or after test result.

1)At the ‘READY’ state, press ‘MEMORY’ key for more than 1 sec.

・’MEMORY’ is converted to reverse displayed.

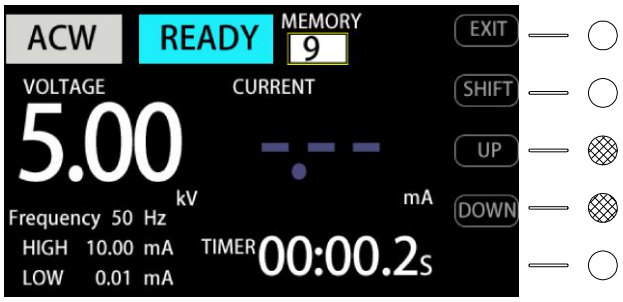


Select memory No.

2)Select the memory No. by UP and DOWN key.

The test condition of the nuber selected is selected.

No.:1－10



End of the call

3)By pressing ‘EXIT’ key for more than 1 sec., the set value is recorded and turned to ‘READY’ state.

Interruption

4)Keep pressing ‘SHIFT’, press ‘EXIT’ for more than 1 sec., the operation is interrupted and turned to ’READY’ state same as previous operation.

。

Confirmation and setting of test conditions

Regarding the procedure and the flow of setting, refer to “6. Setting of Withstand voltage tes t(ACW) conditions” and “7. Setting of insulation resistance tes t(IR) conditions”.

9. Test method (From the start of the test to the judgment)

Operation method of single withstand voltage test

Test start－Test end

1) When START switch is pressed, DANGER lamp is turned on and the test starts.
2)‘TEST’ display is shown to indicate the status of test during high volatage output.
3) During the test, TEST output is obtained by remote I/O connector.
4) When the test is ended, TEST output is also stopped and judgment result and ‘END’ output are turned on .

Interruption of the test

When STOP switch is pressed during the test, the test is interrupted.
It returns to the READY state.

Judgment result

When the judgment is GOOD

When the test time has elapsed, the test is ended and the judgments GOOD and GOOD, ACW GOOD and ‘END’ are turned on.

When the judgment is NG

During the test, in case of NG judgment of the upper limit value and the lower limit value, the test is interrupted, and high voltage output is turned off. Judgment result and ‘END’ are output.

Operation method of single insulation resistance test

Test start－Test end

1) When START switch is pressed, DANGER lamp is turned on and the test starts.
2) ‘TEST’ display is shown to indicate the status of test during high volatage output.
3) During the test, TEST output is obtained by remote I/O connector.
4)When the test is ended, TEST output is also stopped and judgment result and ‘END’ output are turned on .

Interruption of the test

When STOP switch is pressed during the test, the test is interrupted.
It returns to the READY state.

Judgment result

When the judgment is GOOD

When the test time has elapsed, the test is ended and the judgment is GOOD and GOOD, IR GOOD and ‘END’ is output is turned on.

When the judgment is NG

During the test, in case of NG judgment of the upper limit value and the lower limit value, the test is interrupted, and high voltage output is turned off. Judgment result and ‘END’ are output.

Operation method of automatic test

Test start—Test end

1) When START switch is pressed, DANGER lamp is turned on and the test starts.
2) 'TEST' display is shown to indicate the status of test during high volatage output.
3) During the test, TEST output is obtained by remote I/O connector.
4) When the test is ended, TEST output is also stopped and judgment result and 'END' output are turned on .

Interruption of the test

When STOP switch is pressed during the test, the test is interrupted.
It returns to the READY state.

Judgment result

When the judgment is GOOD

When the test time is elapsed, the test is ended and the GOOD judgmentis performed and GOOD, ACW GOOD output, IR GOOD and END are turned on.

When the judgment is NG

During the test, in case of NG judgment of upper limit value and the lower limit value, the test is interrupted and high voltage output is turned off. Judgment result and END are the ou tput.

10. Other functions

Setting of the buzzer

Buzzer rings when the judgment passes or fails.
The on/off setting of the buzzer is possible using setting of the front panel.

Enteringsetting mode

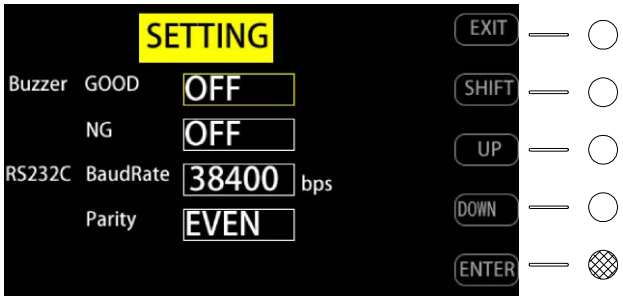
1) At the 'READY', press 'SHIFT' key for longer than 2 sec.

GOOD buzzer

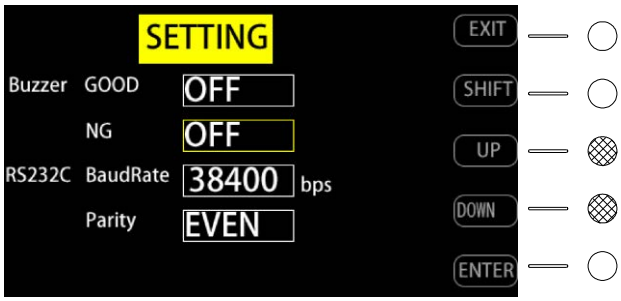
- Condition display is changed to 'SETTING' mode.
(the frame of 'Buzzer GOOD' is changed to yellow color.)

2) Set ON/OFF by pressing 'UP' or 'DOWN' keys.

NG buzzer



3)By pressing 'ENTER' key, select the item of buzzer.



(the frame of Buzzer NG' is changed to yellow color.)

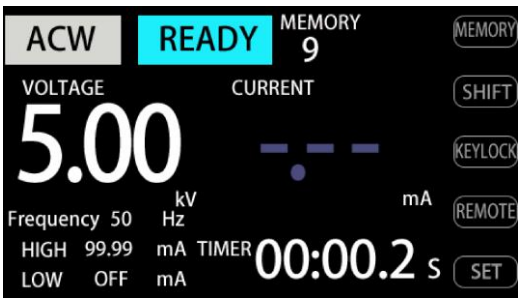
4)Set ON/OFF by pressing 'UP' or 'DOWN' keys.

End of setting By pressing 'EXIT' key for moer than 1 sec. the set value is recorded and display is turned to 'READY' state.
Interruption of setting Keep pressing 'SHIFT', press 'EXIT' for moe rthan 1 sec. operation is interrupted and display is turned to 'READY' state same as previous operation.

Setting of RS-232C

- The Baud Rate and parity of RS-232C can be set.
- Baud rate 9600/19200/38400bps
- Parity NON/EVEN/ODD

Entering setting mode



1)At the 'READY' state, press 'SET' for more than 1 sec.

・ Condition display is changed to 'SETTING' mode.
2)Select 'Baud rate' , by pressing 'ENTER' key.

Baud rate

(the frame of 'Baud Rate' is changed to yellow color.)
3)Select '9600/19200/38400'bps by using'UP' or 'DOWN' keys.

Parity

4)Select 'Parity', by pressing 'ENTER' key.

(the frame of 'Parity' is changed to yellow color.)
5)Select 'NON/EVEN/ODD by using 'UP or DOWN keys.

End of setting
By pressing 'EXIT' key for moer than 1 sec. the set value is recorded and display is turned to 'READY' state.

Interruption of setting
Keep pressing 'SHIFT', press 'EXIT' for moe rthan 1 sec. operation is interrupted and display is turned to 'READY' state same as previous operation.

11. Remote I/O

Test contents using remote I/O

The control of start/stop of the test is possible with sequencer or etc. connected by I/O connector ④ of rear panel.

Main function

Setting conditions

'Remote' is displayed on the front panel, when remote control is connected.

Front panel start switch becomes disabled and START/ACW-START/IR-START of the remote I/O connector becomes effective.

Item	Function Name	Content	Input Pin No.
1	MEM SET 1,2,4,8	Test condition set by "5. Setting of Memory No." is called and is set from external device (sequencer tec.)	6—9

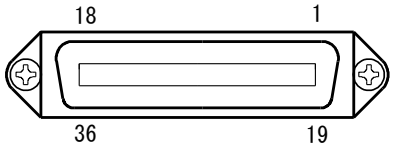
Others

- Signal output corresponding a each state of 850A is always available at open collector output regardless of the REMOTE state.
  Refer "O" for "Connector pin layout and Pin function" for output of pins.
- Interlock is possible depending on ON/OFF setting of remote I/O connector (Pin No. 5) for the protection of the safety.
- Input and output signals have been insulated from the internal circuit in the photo-coupler.

Connector pin array and pin function

I/O	Name of Signal	Pin No.	Function
–	NC	1	Free pin（Do not hook up etc. for wiring）
	NC	2	Free pin（Do not hook up etc. for wiring）
O	TEST	3	Output during the test （When ‘REMOTE’ is set）
I	START	4	Start input signal
	INTER LOCK	5	Interlock signal
	MEM SET1	6	Memory No. calling input signal can be selected from memory No. 1 - No.. 10 by the combination of pin No. 6,7,8,9. Refer to “Combination of Memory No. and MEM SET signals” (P.43)
	MEM SET2	7	
	MEM SET4	8	
	MEM SET8	9	
–	NC	10	Free pin（Do not hook up etc. for wiring）
	NC	11	Free pin（Do not hook up etc. fro wiring）
O	PROTECTION	12	Outputs while protective function in operation
	GOOD	13	Outputs when GOOD judgment
	ACW HIGH	14	Out puts when the judgment is upper limit at withstand voltage test
	ACW GOOD	15	Outputs when the judgment is GOOD at withstand voltage test
	IR HIGH	16	Outputs when the judgment is upper limit at insulation resistance test
	IR GOOD	17	Outputs when the judgment is GOOD at insulation resistance test
–	NC	18	Free pin（Do not hook up etc. for wiring）
COM	COM	19	Common（common with No. 23 and No. 36）
I	ACW-START	20	Start of input signal at withstand volatage test（When ‘REMOTE’ is set） Note
	IR-START	21	Start of input signal at insulation resistance test（When ‘REMOTE’ is set）Note
	STOP	22	Input signal for STOP
COM	COM	23	Common（common with No.19 and No.36）
–	NC	24	Free pin（Do not hook up etc. for wiring）
	NC	25	Free pin（Do not hook up etc. for wiring）
	NC	26	Free pin（Do not hook up etc. for wiring）
	NC	27	Free pin（Do not hook up etc. for wiring）
O	END	28	Output when the test ends
–	NC	29	Free pin（Do not hook up etc. for wiring）
	NC	30	Free pin（Do not hook up etc. for wiring）
O	NG	31	Outputs when the fail judgment(NG)
	ACW LOW	32	Outputs when the judgment is lower limit at withstand voltage test
–	NC	33	Free pin （Do not hook up etc. for wiring）
O	IR LOW	34	Outputs when the judgment is lower limit at insulation resistance test
–	NC	35	Free pin（Do not hook up etc. for wiring）
COM	COM	36	Common（common with No.19 and No. 23）

［Kind of input and output］
I ：Input
O ：Open collector output
COM ：Input Output common
– ：Free pin



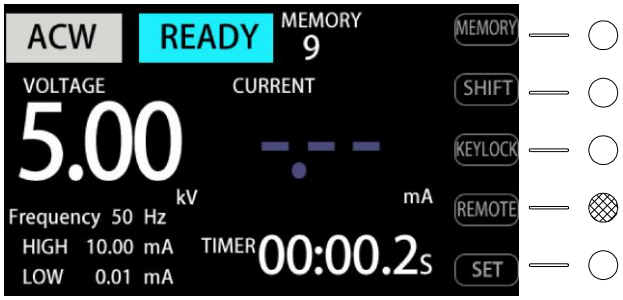
Connector used: 36P Amphenol

Note: ACW START: It becomes invalid during single insulation test mode but withstand voltage test (ACW) can be carried out in Auto mode.
IR START: It becomes invalid during single withstand voltage test but insulation test (IR) can be carried out during Auto mode.

Call Memory No. from remote I/O

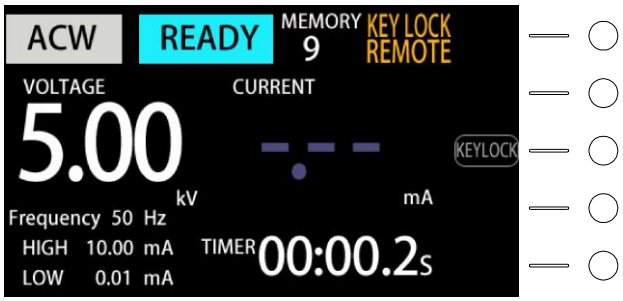
Switch to memory calling (set ‘REMOTE’ state）.

1) At the ‘READY’ state, press ‘REMOTE’ key for more than 3 sec.



READY status

‘REMOTE’ is displayed.



REMOTE status

When in REMOTE state, it will be in KEYLOCK state.

At this state (above), a test can’t be started from panel operation, but STOP key can be used.

Select Memory No.

2) Address setting can be done from the ON/OFF signals of remote I/ O of MEM SET 1,2,4,8,10.

Start test

3）Test start can be done when START of remote I/O is turnedON by non voltage contact.

To cancel ‘REMOTE’, press ‘REMOTE’ key for3 sec. ‘REMOTE’ disappears.

⚠Caution

In case of ON LINE setting through RS-232C interface, the test can not be started from START / ACW-START / IR-START signals of remote I/O connector.
Change to setting for ON LINE status as shown below.

ONLIINE status

Refer to the separate manual [RS-232C interface] for operation method.

Combination of Memory No. and MEM SET Signals

－：Input OFF

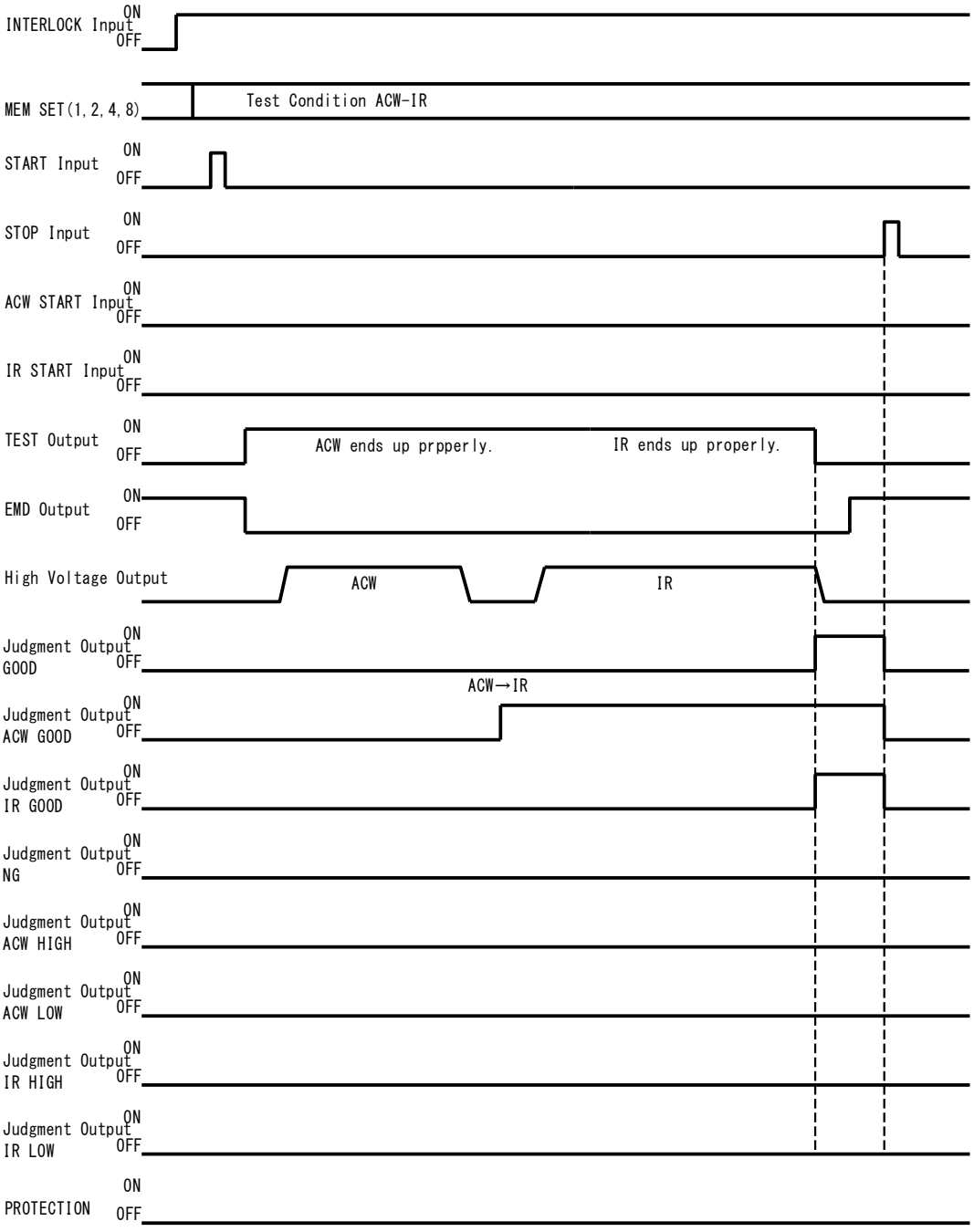
○ ：Input ON

Memory No.	PIN No.27	PIN No. 8	PIN No.7	PIN No.6
	MEM SET10	MEM SET4	MEM SET2	MEM SET1
Blank ※	－	－	－	－
1	－	－	－	○
2	－	－	○	－
3	－	－	○	○
4	－	○	－	－
5	－	○	－	○
6	－	○	○	－
7	－	○	○	○
8	○	－	－	－
9	○	－	－	○
10	○	－	○	－
	○	－	○	○
	○	○	－	－
	○	○	－	○
	○	○	○	－
	○	○	○	○

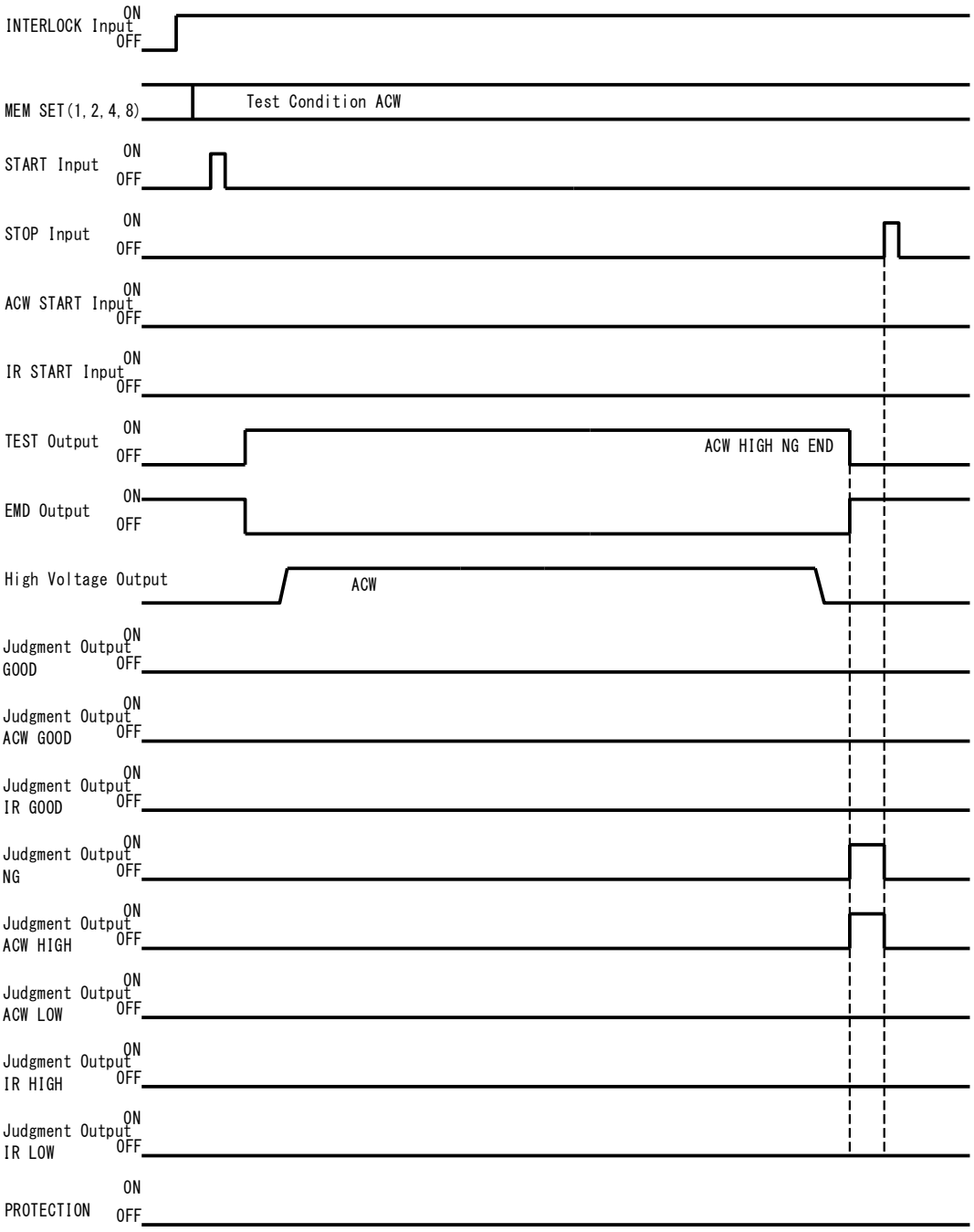
※：When memory No. display is blank, it shows setting mode without memory No.

I/O Control with separate judgment (During ACW-IR GOOD judgment)

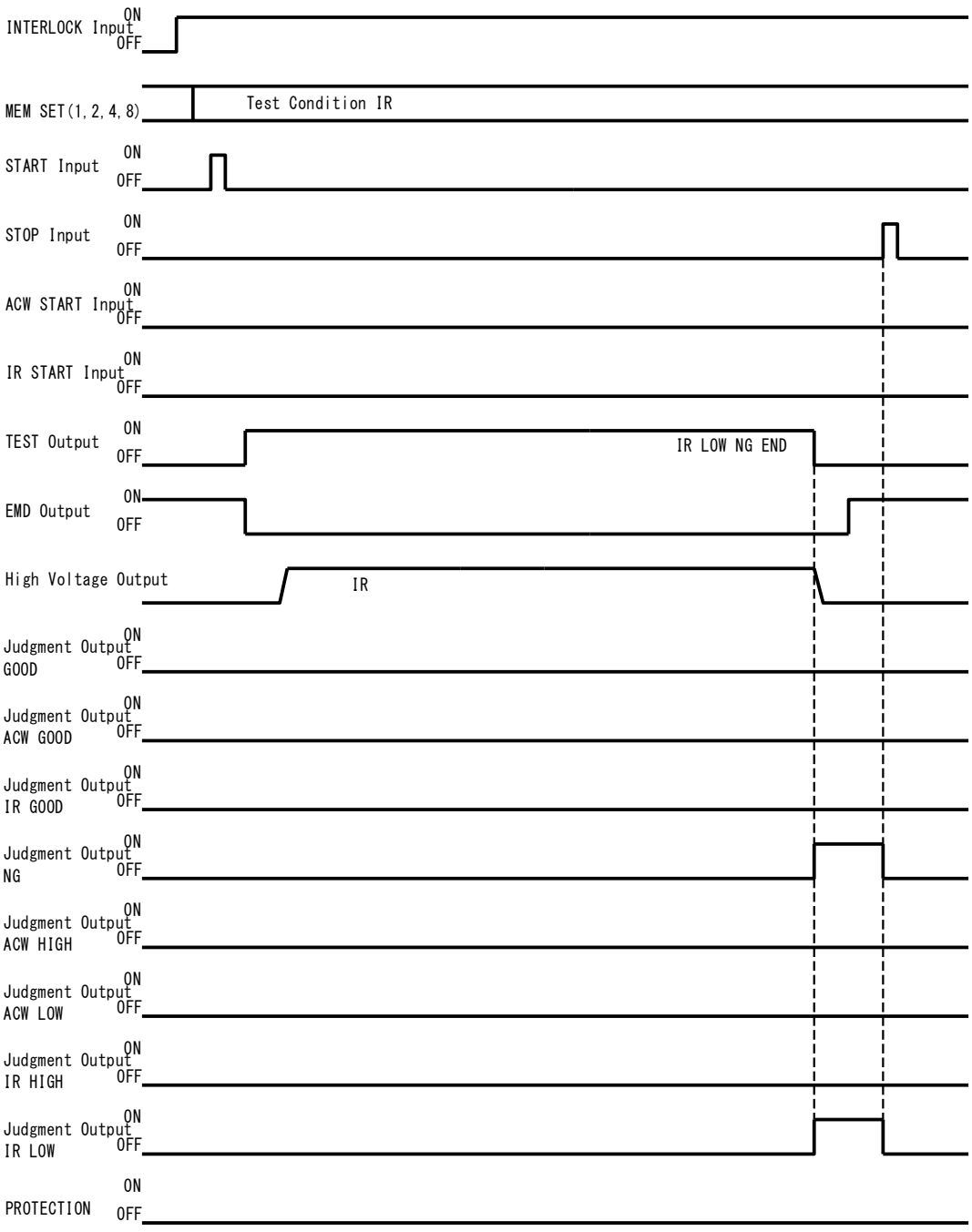
Refer to the Automatic test(ACW-IR) for detail description.



I/O Control with separate judgment (During ACW NG Upper limit judgment)

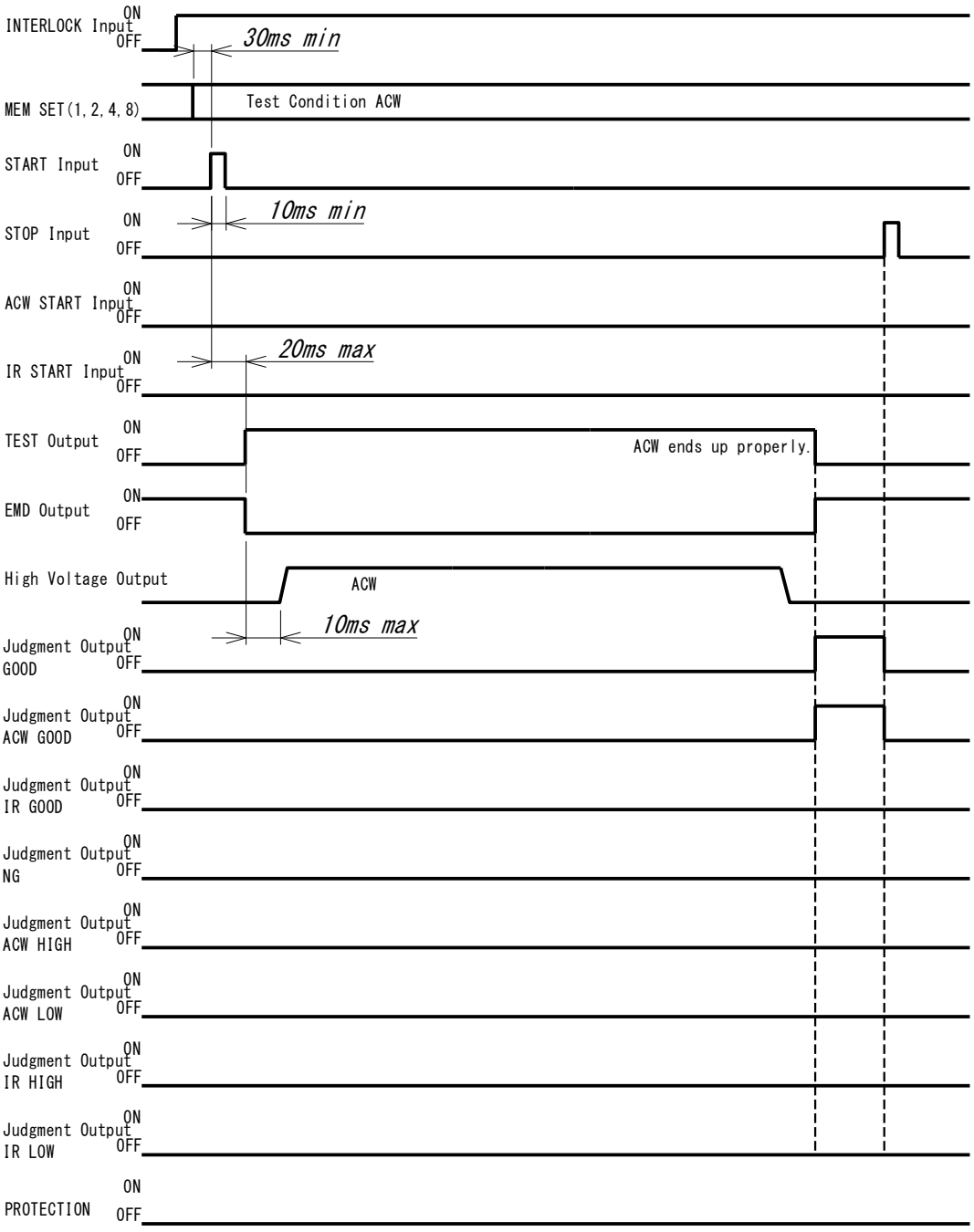


I/O Control with separate judgment(During IR NG Lower limit judgment)

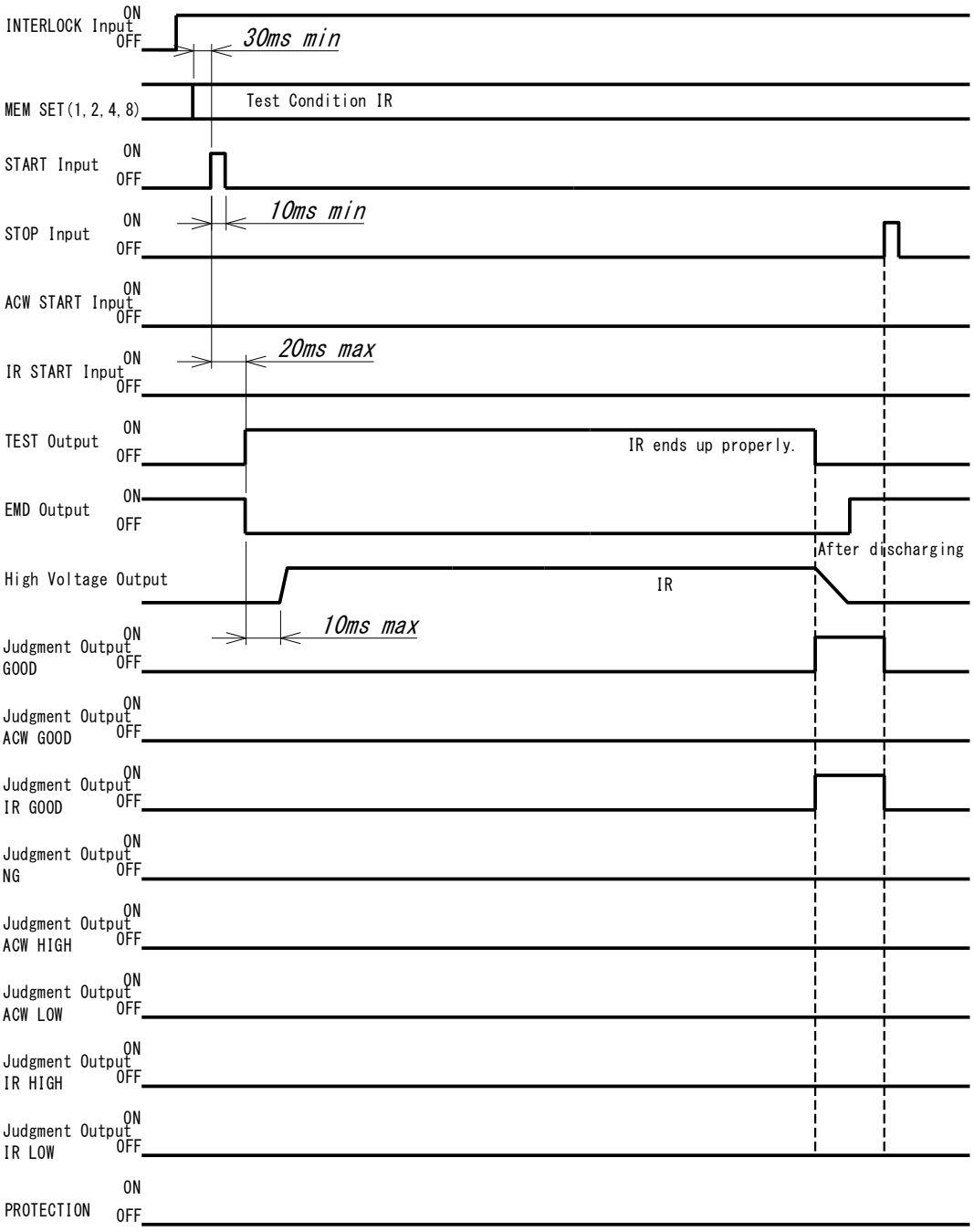


Timing chart: Details from the start to the high voltage output

ACW GOOD judgment



IR GOOD judgment



Interlock signal

Interlock is a function to shut off the output by linking with an external device for ensuring the safety of the workers.

There is an interlock state when INTER-LOCK of remote I/O connector is opened and start of the test is not possible.

During operation of interlock function, there is a display of ERROR, output of 850A is shut off and all the key operations are disabled.

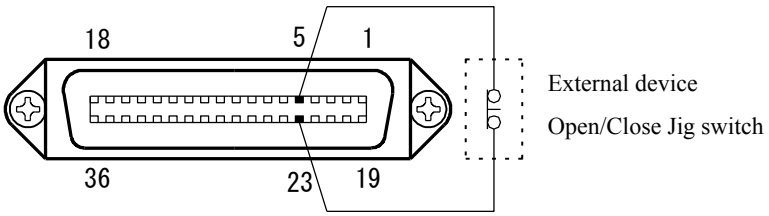
To release the interlock, INTER-LOCK of remote I/O connector and COM is short circuited and STOP switch is pressed with “L” level.

After ERROR display is disappeared, ‘READY’ appears on the display and test is ready.

Note）The supplied remote I/O plug (36P) has short circuited INTER-LOCK and COM.

As shown in the connection diagram example given below, allow the adequate interlock processing where safety is considered like linking with an external device etc.

Remote I/O connector



Interlock connection example

Protective function operation（PROTECTION）

The protective function operation is an action that outputs PROTECTION due to the remote I/O connector during the undermentioned time of conditions.

- When the test is ended and when the discharge of the specimen is not completed even in 10 sec. after the test.
- When the Interlock input is turned off during test.
- When the output voltage falls below 50% of the setting during the withstand voltage test.
- When internal parts are abnormal.
- When a fan becomes abnormal or malfunctions, or when it stops due to the life of the fan.

Method to cope

- Refer “13．Error MessageError message”

Input signal

Start and stop control of this tester is possible by the external input signal.
Besides, it is possible to call the setting of the registered test conditions in the memory.

(1)Input signal specification（Pin No.4—9、20—22）

Control input ：Active LOW

Input level ：”H“=16.8—24V

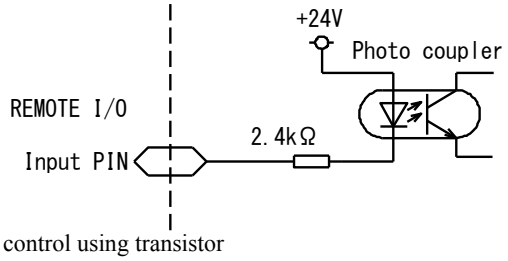
”L“=0—3.8V

L level drive current :Ic=10mA

L level minimum pulse width :10ms

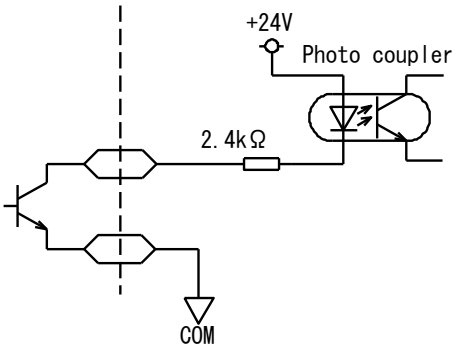
Isolation YES

(2)Internal circuit configuration



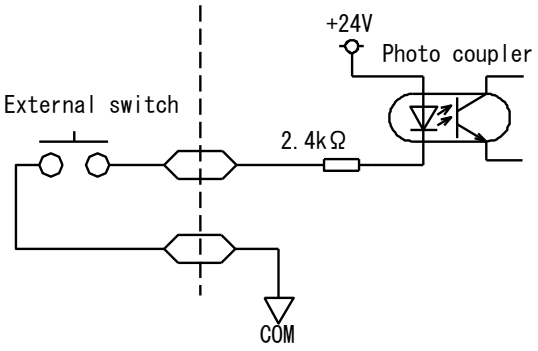
(3)Example of control using transistor

Design the collector current with maximum 10mA.



(4)Example of control using external switch

Provide the circuit to prevent relay or chattering of the switch.

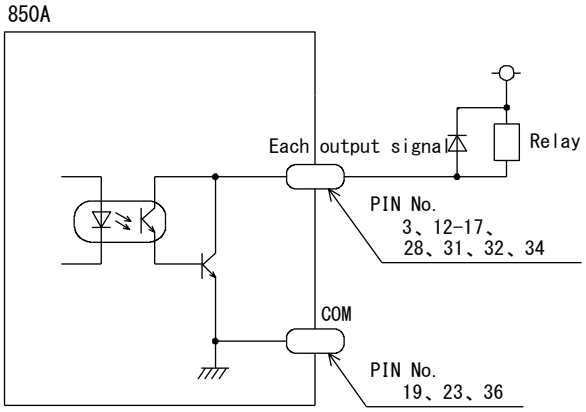


Output signal and control power supply

Each state of output signal of 850A can be obtained.

(1)Output signal specification（Pin No. 3, 12－17, 28, 31, 32, 34）

Signal format : Open collector output
Maximum load voltage: DC30V
Maximum output current: DC30mA
Isolation YES
Output saturation voltage: Less than DC1.6V



Example of relay drive connection

⚠Caution

・Use output signal less than DC30V 30mA.

・In case of inductive load control like relay etc., connect the coil and the diode in par alleland absorb the counter electromotive force.

12. Remote control

RS-232C Interface

Refer to the separate instruction manual I-02447.

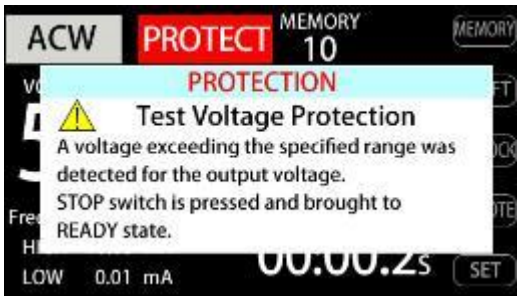
13. Error Message

Error display

When an error occurs, 850A can not be used unless the error is solved.
Follow the following instruction to remove the error.
※ : 'PROTECTION' is obtained from the remote I/O connector ④.

When Power is ON, Self check is done.
（FAN, Internal AD、 Internal flash memory, Internal communication, Turning on DANGER lamp）

Even though 'DANGER' lamp is turned on, no voltage output obtained.
Confirm the 'DANGER' lamp blinking, and if NG message is displayed on the front panel, contact the distributor or the nearest office of Tsuruga Electric Corporation.

Error Message	Content
Power Amp Protection 	**Cause** Power Amp. Protection error message is obtained when abnormal or some malfunction on internal are found. **Countermeasure** Turn off the power switch soon. 850A might have been damaged. Contact the distributor or the nearest office of Tsuruga Electric Corporation.
FAN ERROR Protection 	**Cause** Abnormal or some malfunction in FAN. Stop of FAN because of its life span. **Countermeasure** Turn off the power switch soon. Contact the distributor or the nearest office of Tsuruga Electric Corporation.
Test Voltage Protection 	**Cause** During withstand voltage test, output voltage becomes less than 50% of the set value. **Countermeasure** 'STOP' switch can release this error. Disconnect the high voltage cable and perform the test again, if the error still occurs, turn off the power switch soon. 850A migt have been damaged. Contact the distributor or the nearest office of Tsuruga Electric Corporation. If the error is not displayed, confirm the connection of high voltage cable.

Interlock Protection

Cause

Interlock protection error message is obtained, when the interlock signal becomes OFF before the test start or during the test period.

Countermeasure

Reconfirm the connection or sequence again, and reconnect the Interlock properly again.

'STOP' switch can release this error.

Over Heat Protection

Cause

Over heat protection error message is obtained, when internal parts are over heated because of long use of test.

Countermeasure

Stay power ON and keep waiting, till the 850A is cooled down.

After sufficient heat dissipation, 'STOP' switch can release this error.

Error Discharge

Cause

Error discharge message is obtained, if the discharge of specimen is not completed even after 10 sec. of IR test, or the charge on the specimen still remains without proper discharge.

Countermeasure

Leave 850A for some time, and continue discharging.

After enough discharge, 'STOP' switch can release this error.
If the discharge can not be done properly, 850A may be damaged.
Contact the distributor or the nearest office of Tsuruga Electric Corporation.

14. Maintenance

Cleaning

In order to remove the dirt from this tester, wipe lightly by a soft cloth with small amount of water and small amount of mild neutral detergent.
Do not use detergents containing solvents like benzene, alcohol, paint thinner etc. It may cause deformation and decoloration.

Problem solving

In order to solve the problem, check the description in “Problem solving” and contact the nearest distributor or the nearest sales office.
When breakdown goods are to be returned,
The goods are to be packed so that it does not get damaged during transportation and write and attach the breakdown description as well. There is no guarantee for the damage during transportation.

When you think that there is a breakdown

Conditions	Whant must be confirmed?	Countermeasure
No display even when the power switch is turned on.	Check if the power code is unplugged.	Plug in the power code.
Cannot the operate keys.	Is it the key lock state?	Release the key lock.
Test is not started even when ‘START’ switch is pressed.	・Is ’READY’ displayed? ・Is ’REMOTE’ not displayed and remote operation set? ・Is ’ONLINE’ displayed?	・’START’ switch is disabled during remote control. Refer to chapter 11 to 12.
Error display	Error display	Refer to the Chapter 13.

Calibration

For the long protection of accuracy, it is recommended to calibrate the instruments every year.
Customers are requested to contact the sale offices of Tsuruga Electric Corporation or the distributor of Tsuruga Electric Corporation for the calibration.
However, the repair and calibration may be refused if the production of the part is abolished after certain elapse of time or if the warranty range is not covered.

About life span parts

Time confirmation of life parts (see 15. Display of main unit information)

FAN:
FAN is a lifetime component.
The design life is assumed to be 70,000 hours.
If the usage time is more than 70,000 hours, we recommend that you ask us for replacement.

LCD backlight:
LCD backlight is a lifetime component.
The design life is assumed to be 50,000 hours.
If the usage time is over 50,000 hours, we recommend that you ask us for replacement.

15. Specifications

Withstand voltage test

・Test voltage

Applied voltage ：AC0.20－5.00kV

Output capacity ：500VA (5kV, 100mA)

Continuous application time of the maximum current output within 1 min. (the rest-time is equal to or longer than output-time)

Wave form ：Sine wave（Rate of strain: Less than 5% , more than AC0.5kV No-load）

Power frequency ：50-60Hz （Regardless of the power frequency 50-60Hz switchable）

Voltage fluctuation rate ：Less than 15%（Maximum rating → No-load：In resistive load）

Voltage application method：Zero cross switch

After the time up and NG judgment time, cut off applied voltage

Applied voltage setting ：Digital setting (Setting resolution 0.01kV)

Setting accuracy ±(2.0% + 20V)of the setting, No-load AC0.00 - 5.50kV

・Voltage measurement

Rectification method ：Average rectified effective value display

Digital display ：Display range 0.00 - 6.00kV

Resolution 0.01kV
Measurement accuracy ±(0.5% of F.S. +10V) , Range of test voltage AC0.05 - 5.00kV
Operation Show the applied voltage during the test
At the end of the test, retain the display of the end time of the test.
The value of NG judgment is not necessarily the value at the time of NG judgment from the relationship of response speed.
Response time 100ms

・Current measurement

Rectification method ：Average rectified effective value display

Digital display ：Measurement range 0.00－99.99mA

Resolution 0.01mA
Measurement accuracy ±(2% of rdg. + 0.05mA)
Operation Display the current during the test
At the end of the test, retains the display of the end time of the test.
Analog comparator operation becomes 'OVER' display
'OVER' display 'OVER' is displayed
When it exceeds 99.99mA, when overcurrent like spark etc. flows, or when the analog comparator is activated 99.99mA.
Response time 100ms

Judgment method ：Upper limit Digital comparator and analog comparator detects the current that exceeds 99.99mA
Lower limit Digital comparator

Setting ：Setting range Upper limit 0.05－99.99mA
Lower limit 0.01－50.00mA / OFF
Resolution 0.01mA

Judgment conditions ：Upper limit setting≧Current≧Lower limit setting ・・・ GOOD
Upper limit setting＜Current ・・・・・・・・・・・・・・・・・・ HIGH NG
Lower limit setting＞Current・・・・・・・・・・・・・・・・・・・ LOW NG

・Test time

Setting range ：00:00.2－99:59.9sec. and OFF（continuous）

Setting resolution ：0.1sec.

During test When the time is set, displays the remaining time.
When setting is OFF, displays the elapsed time.
At the end of the test Displays remaining time
Displays remaining time
By timer OFF setting during NG judgment Displays the elapsed time
At the waiting Displays the setting value

Accuracy ：Set value± (0.1% +20ms)

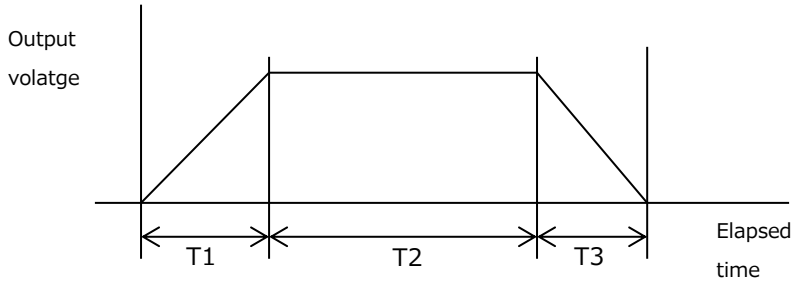
・Rise/Fall time

Function ：The function to raise and fall the test voltage output by setting time

Setting range ：00:00.1－01:59.9 sec. and OFF

Setting resolution ：0.1 sec.

Accuracy ：Set value±(0.1% +20ms)



T1 : Rise time

T2 : Test time

T3 : Fall time

Application time＝T1+T2+T3

Insulation resistance test

Rated measurement voltage ：DC500V/1000V

No load voltage ：Within 125% of the rated voltage

Rated current ：1mA

Short circuit current ：Less than 15mA

Display ：Measured value display 0—9990

Zero suppression (more than 2000, the lowest digit is fixed as 0)

'OVER' display 'OVER' is displayed：when input is open or when over

'UNDER' is displayed：The measured resistant value is less than the fixed range.

Auto range ：Resolution within measurement range is switched automatically, Rise time is switched at 2000 and Fall time is switched at 179.

Operation Insulation resistance value is displayed during the test.

At the end of the test, retains the display of the end of the test

Externally applied voltage ：Less than1.2 times measured voltage, Maximum 600V 50-60Hz Less than 10sec.

Measurement rangeand Accuracy：

Rated measurement voltage	Resistance range	Resistance Measurement range	Median	Resolution	Accuracy
DC 500V DC1000V	20.00MΩ	0.00—20.00MΩ	5MΩ	10kΩ	±(2% of rdg.+3digit)
		20.10—49.90MΩ		100kΩ	±30% of rdg.
	200.0MΩ	18.0—200.0MΩ	50MΩ	100kΩ	±(2% of rdg.+3digit)
		201.0—499.0MΩ	※	1MΩ	±30% of rdg.
	2000MΩ	180 —1000MΩ	500MΩ	1MΩ	±(2% of rdg.+3digit)
		1001 —2000MΩ		1MΩ	± 5% of rdg.
		2010 —5000MΩ		10MΩ	±30% of rdg.
		5010 —9990MΩ			

Accuracy: Fixed at the state of 23℃±5℃、45—75%RH

Caution） During Automatic range measurement ※remarks become the median

・Judgment test result

Judgment method ：Upper and lower limit digital comparator

Setting range ：Upper limit 00.01—99.99/000.1—999.9/1—9999/OFF

Lower limit 00.01—99.99/000.1—999.9/1—9999

Judgment conditions ：Upper limit setting≧Insulation resistance value≧Lower setting value･･･ GOOD

Upper limit setting＜Insulation resistance setting･･･････････････････ HIGH NG

Lower limit setting＞ Insulation resistance value･･･････････････････ LOW NG

・Test time

Setting range ：00:00.2—99:59.9 sec.

Setting resolution ：0.1 sec.

Accuracy ：Setting value± (0.1% +20ms)

During test Display remaining time

At the test end Display remaining time

At waiting Display setting value

Response speed Display response and judgment time

Auto range 0.4 sec.（center value）

Fixed range 0.2 sec.（center value）

Note） In case of the test objective with large ground capacitance, the resistance value measured may become low with the elapse of time.
For setting the appropriate time, confirm sufficiently the time to stabilize the measurement value and the test time so that there is no wrong judgment.

・Mask time

Setting range ：00:00.1－01:59.9 sec.

Mask time＜Test time

Setting resolution ：0.1 sec.

Accuracy ：Setting value ±(0.1% +20ms)

・Discharging function

It is the function to discharge the electric charge which has been charged in the test specimen during insulation test.

Memory operation

Memory contents ：Memorize the test conditions of withstand voltage test and insulation resistance test

Number of piece ：10 pieces

Memory retention ：Stored in a non-volatile memory

Memory period 10years

Readout the memory ：Key operation, remote I/O connector, RS-232C

Setting method ：Key operation, RS-232C

Other functions

Interlock ：When the rear connector pin is open, it is in locked state.

Key lock ：Depending om the switch operation, it is a function to prohibit switch operation other than key

Lock.buzzer ：Function to ring the buzzer depending on the judgment content.(OFF setting possible)

Input Output signal

Connector ：36P Amphenol connector

Output signal ：Open collector DC30V 30mA MAX.

Output signal name ：END ：the end

TEST ：During the test

GOOD ：Pass judgment（continuous）

NG ：Fail judgment（continuous）

ACW HIGH ：Withstand voltage upper limit judgment（continuous）

ACW LOW ：Withstand voltage lower limit judgment（continuous）

ACW GOOD ：Withstand voltage pass judgment

IR HIGH ：Insulation upper limit judgment（continuous）

IR LOW ：Insulation lower limit judgment（continuous）

IR GOOD ：Insulation pass judgment

PROTECTION ：At the Protection functioned

Input signal ：H=16.8－24V, L=0－3.8V

Ic=10mA, Ｌ level minimum pulse width=10ms

Input signal name ：START

STOP

INTER LOCK

ACW-START

IR-START

MEM SET1, MEM SET2, MEM SET4, MEM SET8

Note: In case of memory No. 10, input of ACW-START and IR-START become invalid.

REMOTE I/O connector

Signal name	Pin No.		Signal name
NC	1	19	COM
NC	2	20	ACW-START
TEST	3	21	IR-START
START	4	22	STOP
INTER LOCK	5	23	COM
MEM SET1	6	24	NC
MEM SET2	7	25	NC
MEM SET4	8	26	NC
MEM SET8	9	27	NC
NC	10	28	END
NC	11	29	NC
PROTECTION	12	30	NC
GOOD	13	31	NG
ACW HIGH	14	32	ACW LOW
ACW GOOD	15	33	NC
IR HIGH	16	34	IR LOW
IR GOOD	17	35	NC
NC	18	36	COM

RS-232C Interface

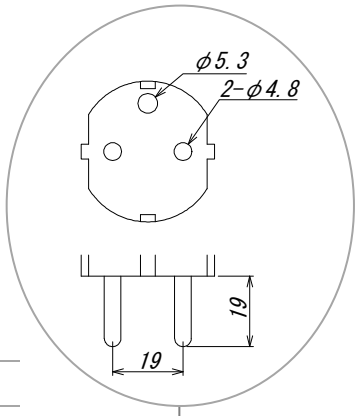
- Function : Output the setting of the test conditions and test result data.
- Connector : D-Sub 9P
- Transmission system : Asynchronous method
- Transmission speed : 9600 / 19200 / 38400 bps
- Data length : 8bit
- Parity : None / Even / Odd

General specification

The rated data for warm up is specified for more than 30 minutes.

- Power supply : AC100V - 240V 50-60Hz
- Power supply voltage tolerance range : AC90V - 250V
- Power consumption : 760VA max
- Operating temperature range : 0 - 40℃
- Operation humidity rage : Less than 80%RH（Non-condensing）
- Storage temperature : -20 - 70℃
- Use environmental conditions : Indoor use
  : Altitude: Less than 2000 m
  : Overvoltage category: OVC Ⅱ
  : Pollution degree: 2
- Protection grade : IPX0(IP20 Compliance)
- Withstand voltage : Power terminal－Outer box AC1350V 1min.
- Weight : Approx. 18kg
- Accessories :

High voltage cable	2m	1 piece
Earth cord	3m	1 piece
Power cord	2.5m	1 piece
Remote I/O plug		1 piece
Operating manual(this book)		CD
RS-232C Interface manual		CD



- Option

Part name	content
5858-21	Key cover
5880-23-030	Power code for AC200V 3m （For Europe 2 pole with earth type）
5890-18	Utility software Test setting and recording of test results can be managed from the screen of PC. Accessory：Utility software manual 1 part CD-R 1 piece
5881-11-018	RS-232C cable 1.8m

Adaptability

This product is in conformity with the following standards ;

EN61010-1 2010

Pollution degree 2

Overvoltage category OVC Ⅱ

Measurement category CAT 0

EN61326-1: 2013 Table2 *1

EN55011: 2009+A1: 2010 *2

EN61000-4-2: 2009

EN61000-4-3: 2006+A1: 2008+A2: 2010

EN61000-4-4: 2012

EN61000-4-5: 2014

EN61000-4-6: 2014

EN61000-4-8: 2010

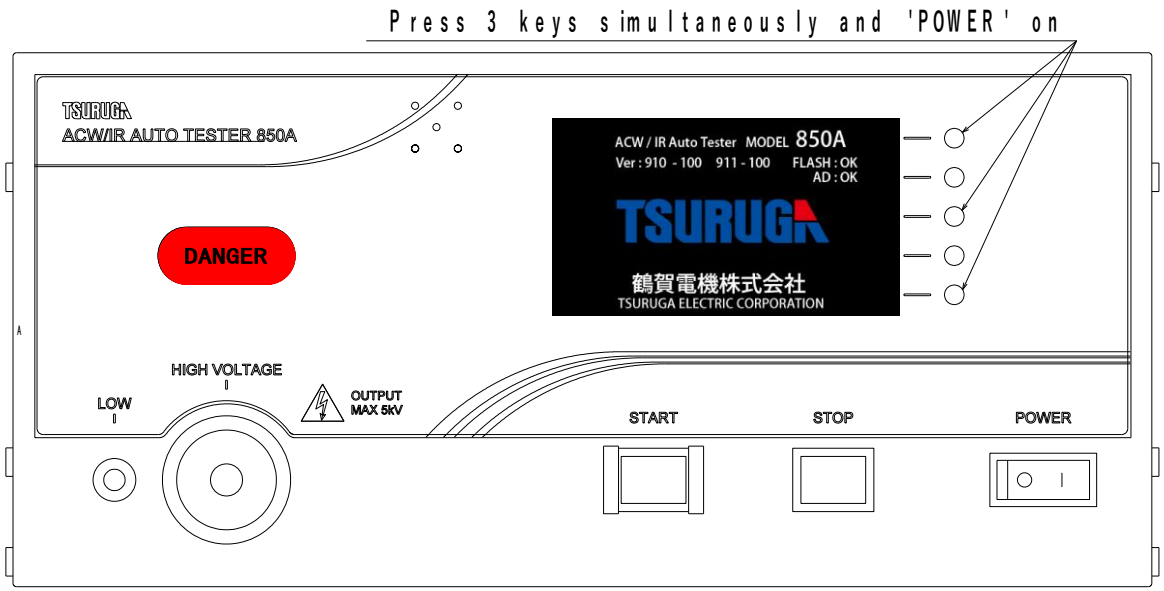
EN61000-4-11: 2004

*1 In industrial locations

Setting of the default value

To initialize the tester 850A

1）Keep pressing the 3 keys at the same time as below and turn on the ‘POWER’.



During the Starting-up, the firmware version is displayed.
After 3 sec., ‘DANGER’ lamp blinks on and off, initializing this tester is undertaken.
Once the initialing is run, various settings such as test conditions and data that have been saved become the initial value as shown below,

Default value （common through Memory No. 1－10）

Test mode	Memory No.	.Withstand voltage test conditions ACW		Insulation resistance test conditions IR	
ACW-IR Note) memory no.10 is IR1-ACW-IR2	1	Test voltage	0.00kV	Test voltage range	500V
		Upper limit judgment value	10.00mA	Resistance range	AUTO
		Lower limit judgment value	OFF	Upper limit resistance value	OFF
		Voltage rise time	OFF	Lower limit resistance value	10.00MΩ
		Voltage fall time	OFF	Mask time	0:00.1s
		Test time	01:00.0s	Test time	01:00.0s
		Frequency of the test voltage	50Hz		

Other functions
GOOD buzzer ：OFF
NG buzzer ：ON

RS-232C baud rate ：9600bps
RS-232C parity ：None

Display of information

When the Power switch is turned on while pressing the STOP switch
After 3 seconds, the following items of the main unit information will be displayed.

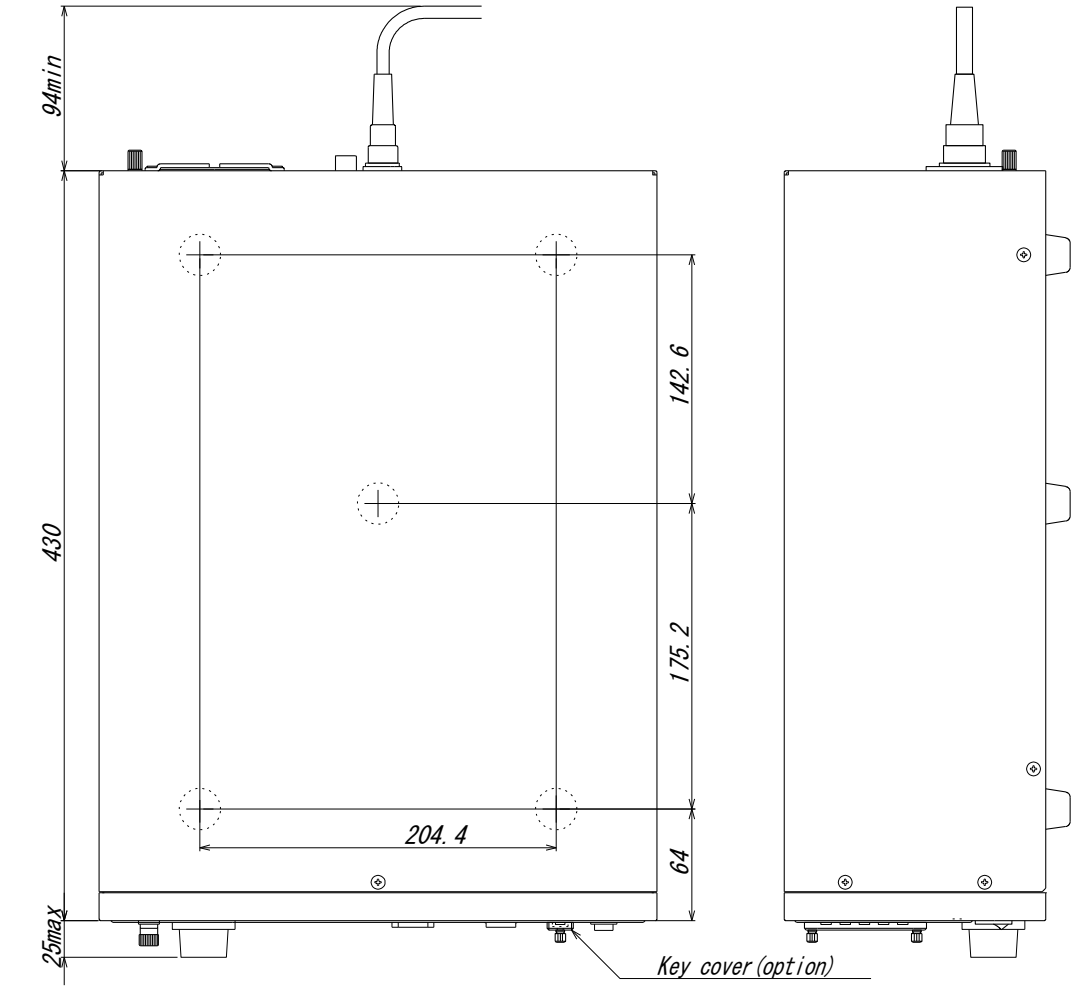
Press the STOP switch to READY state.
Note) After about 5 minutes, it will automatically return to READY status.

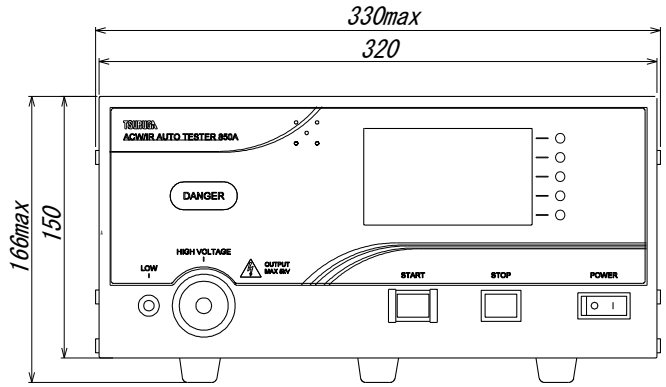
Serial Number	The serial number is displayed.
Power On Hours	Displays the operating time of the 850A.

FAN is a lifetime component.
The design life is assumed to be 70,000 hours.
If the usage time is more than 70,000 hours, we recommend that you ask us for replacement.

LCD backlight is a lifetime component.
The design life is assumed to be 50,000 hours.
If the usage time is over 50,000 hours, we recommend that you ask us for replacement.

Dimensions





Unit: mm

MEMO (Feel free to use this page as a memo.)

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TSURUGA

RS-232C Interface

for MODEL 850A

Operation Manual

I-02447

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1. External interface

RS-232C Interface

Specification

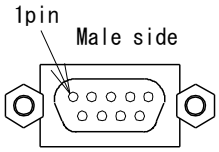
Even if the STOP command and the STOP switch are pressed while the judgment result is displayed, Transmission buffer judgment results and data are held until the next start.

Transmission method	Asynchronous Full2 fold
Transmission speed	9600bps, 19200bps, 38400bps
Data bit length	8 bit
Stop bit	1 bit
Parity bit	None, Odd, Even
Delimiter	CR+LF
Xon/ Xoff	None
Receive buffer length	1000 bytes
Connector	D-sub 9 pin（male）

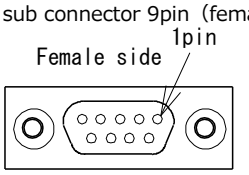
2. Connection

Connector and signal

850A Connector: D sub 9pin（male)



Host side: D sub connector 9pin（female)



Pin No.	Signal Name	Direction	Function
①			Unused
②	RD (RXD)	←Host	Received data
③	SD (TXD)	→Host	Transmission data
④	NC		Unused
⑤	SG (GND)		Signal ground
⑥	NC		Unused
⑦	NC		Unused
⑧	NC		Unused
⑨	NC		Unused

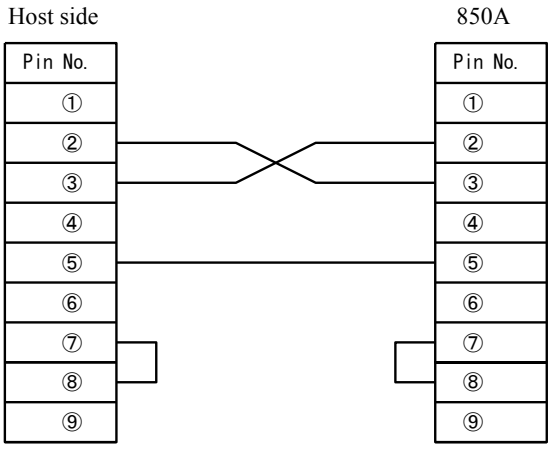
Recommended connector:
XM3D-0921（OMRON）
Recommended hood:
XM2S-0913（OMRON）
Inch screw
Note）External connector and cable, Model 5881-11-018; 9pin-9pin/1.8m（option） are also availbale.

Connection to the host (reference)

Connection cable：Use a cross cable 5881-11-018.

(If the cable other than the specified is used, there may be the case of communication failure.)

Connection of cable



3. Setting of this tester to communicate

Setting items

Match the setting of ⓐ and ⓑ with the communication equipment.

Setting item		Default value
ⓐ Transmission speed	9600bps	○
	19200bps	
	38400bps	
ⓑ Parity	None	○
	Odd	
	Even	

Setting method

Refer to the section of RS-232C setting in the 850A Operation manual ”10.Other settings”.

4. Before the communication

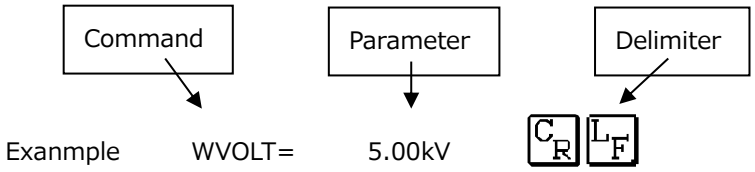
⚠Caution

・When turning on the power, control the command after the READY screen is displayed.
・If the command is to be transmitted, make the interlock state in advance.
Avoid to perform key operation setting of this tester and communication setting simultaneously.
Refer to the key lock operation method mentioned in “3. Panel operation” in 850A Operation manual.
・During remote operation mode, if MEM SET 1, 2, 4, 8 are set to 0, set changing can be possible from RS-232C.
・When it is online (ONLINE = ON), it will be in KEYLOCK state.
During ’On line (ONLINE=ON)’ mode, ‘START’ command becomes valid.

Remote I / O connector START / ACW-START / IR-START,
The START switch on the front panel is invalid.
The STOP on the remote I / O connector and the STOP switch on the front panel are valid.

5. Structure of command and response

Structure of command



1. Command: Command to control 850A
   Either Capital or Small letters can be used.
2. Delimiter: This means there is a break in transmitted data.
3. Command, parameter and delimiter use JIS 8bit code.
4. In case there is no parameter, transmit the delimiter following the command.
   [Example] START[CR][LF]
5. Even if the unit of the parameter is not mentioned, 850A responses.

Caution during command transmission

Transmit setting command（○○○○=）when 850A is in READY state.

When setting command is transmitted by the host during the test, 850A transmits to host the “TEST” for the test period.

Structure of response

When command is transmitted to 850A by the host, the host performs the analysis and processing and returns the response.

When the received data is incompatible, 850A returns an error code to the host.

Refer to the **tips of the error code and solution for detail.**

[When setting and operation command is valid]

○ For valid setting and operation command, **ERROR=0R** is always returned to the host.

Example Valid command ：In case of START[CR][LF]

Response ：ERROR=0

[When setting and operation command is invalid]

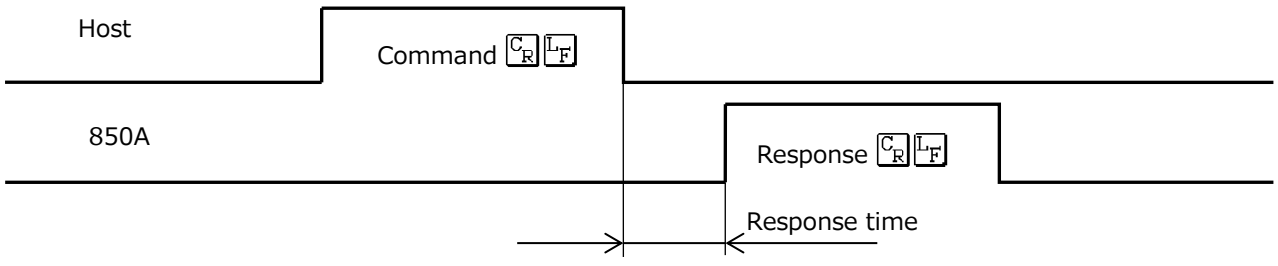
○ For invalid setting and operation command, **ERROR=error cod**e is always returned to the host.

Example Invalid command：STAT[CR][LF]・・・when there is a mistake in spelling during test interruption

Response ：ERROR=1

Response time

As the response time of command list of next page is the reference value, it changes depending on the condition of use.
The performance of 850A is not guaranteed



6. Command list

Description			Command	Page	Response time
Save the setting			**STOR**	8	Approx.2s
Reading of the device information			**IDNT?**	7	Approx.30ms
Reading of the state			**STATUS?**	7	
Online control		Setting	**ONLINE=**	7	
		Reading	**ONLINE ?**	7	
Key lock		Setting	**KEYLOCK=**	8	
		Reading	**KEYLOCK ?**	8	
Start of the test			**START**	8	
Discontinuation of the test, Judgment reset			**STOP**	8	
Setting mode		Setting	**MODE=**	8	
		Reading	**MODE?**	8	
Withstand voltage test	Test voltage	Setting	**WVOLT=**	8	
		Reading	**WVOLT?**	8	
	Upper limit judgment value	Setting	**WHIGH=**	8	
		Reading	**WHIGH?**	9	
	Lower limit judgment value	Setting	**WLOW=**	9	
		Reading	**WLOW?**	9	
	Test time	Setting	**WTIMER=**	9	
		Reading	**WTIMER?**	9	
	Voltage rise time	Setting	**WRTIMER=**	9	
		Reading	**WRTIMER?**	9	
	Voltage fall time	Setting	**WFTIMER=**	9	
		Reading	**WFTIMER?**	9	
	Frequency	Setting	**WFREQ=**	9	
		Reading	**WFREQ?**	10	
	Output voltage	Reading	**WMVOLT?**	10	
	Leakage current	Reading	**CURRENT?**	10	
Insulation resistance test	Test voltage	Setting	**IVOLT=**	10	
		Reading	**IVOLT?**	10	
	Resistance range	Setting	**IRANGE=**	10	
		Reading	**IRANGE?**	10	
	Upper limit judgment value	Setting	**IHIGH=**	10	
		Reading	**IHIGH?**	11	
	Lower limit judgment value	Setting	**ILOW=**	11	
		Reading	**ILOW?**	11	
	Mask time	Setting	**IMASK=**	11	
		Reading	**IMASK?**	11	
	Test time	Setting	**ITIMER=**	11	
		Reading	**ITIMER?**	11	
	Resistance	Reading	**RESISTANCE?**	11	
	Output voltage	Reading	**IRVOLT?**	11	
Reading of the test result and data in a bulk		Reading	**DATA?**	12	
Reading of the measured data in a bulk		Reading	**DATA2?**	14	
Panel setting mode test condition		Setting	**SET=**	15	
		Reading	**SET?**	15	
Switching of memory No. 1 - 10		Setting	**MEMORY=**	16	
		Reading	**MEMORY?**	16	
Test condition of memory 1 - 10		Setting	**MEM□=**	16	
		Reading	**MEM□ ?**	17	

7. Individual command description

1) IDNT?

Reading of the device information

Syntax **IDNT?**

Transmission **IDNT?**CR LF

Response **IDNT=**①,②,③,④CR LF

① Maker name **TSURUGA**
② Model name **850A**
③ Software version **910-100**
④ serial No. **C4300000** (Example)

2) STATUS ?

Reading of the 850A state

Syntax **STATUS?**

Transmission **STATUS?**CR LF

Response **STATUS=**①,②,③,④CR LF

Types of parameters

Weight of data				Parameter	Output signal name
①	②	③	④		
0	0	0	1	TEST	Under test
0	0	0	2	END	Test end
0	0	0	4	DISCHARGE	Under discharge
0	0	0	8	READY	READY state
0	0	1	0	ACW-TEST	Under withstand voltage test
0	0	2	0	IR-TEST	Under insulation resistance test
0	0	4	0	GOOD	Pass judgment
0	0	8	0	NG	NG judgment
0	1	0	0	ACW HIGH	Withstand voltage test upper limit judgment
0	2	0	0	ACW LOW	Withstand voltage test lower limit judgment
0	4	0	0	ACW GOOD	Withstand voltage test pass
0	8	0	0	IR HIGH	Insulation resistance test upper limit judgment
1	0	0	0	IR LOW	Insulation resistance test lower limit judgment
2	0	0	0	IR GOOD	Insulation resistance test pass
4	0	0	0	PROTECTION1	Protection operation 1
8	0	0	0	PROTECTION2	Protection operation 2

Response example 1 **STATUS=0021** CR LF
IR-TEST+TEST
During insulation resistance test, during test

Example 2 **STATUS=2442** CR LF
IR GOOD+ACW GOOD+GOOD+END
During insulation resistance test pass, withstand voltage test pass, Pass judgment, Test end

PROTECTION	① Weight of data
INTER LOCK/DISCHARGE	PROTECTION1+ PROTECTION2
OVER HEAT	PROTECTION2
AMP ERROR/TEST VOLTAGE/FAN ERROR	PROTECTION1

3) ONLINE =

Setting of the 'On line control'

Syntax **ONLINE =** [**ON**/**OFF**]

Transmission **ONLINE =** [**ON**/**OFF**]CR LF

4) ONLINE?

Reading of the 'On line control'

Syntax **ONLINE?**

Transmission **ONLINE?**CR LF

Response **ONLINE =ON** CR LF
ONLINE =OFF CR LF

5) KEYLOCK=	Setting the key lock
	Syntax **KEYLOCK=**[ON/OFF]
	Transmission **KEYLOCK=**[ON/OFF] CR LF
6) KEYLOCK?	Reading of the key lock state
	Syntax **KEYLOCK?**
	Transmission **KEYLOCK?** CR LF
	Response **KEYLOCK=ON** CR LF **KEYLOCK=OFF** CR LF
7) STOR	Save the setting contents
	Syntax **STOR**
	Transmission **STOR** CR LF If this is transmitted during 'READY' state, ERROR=9 is responded
8) START	Test is started in READY state
	Syntax **START**
	Transmission **START** CR LF When ONLINE=OFF, 'ERROR=6' is responded
9) STOP	Discontinuation of the test. When run in the state of judgment issued, returns to the READY state.
	Syntax **STOP**
	Transmission **STOP** CR LF
10) MODE=	Setting the test mode
	Syntax **MODE**=[Parameter] [Parameter] **ACWIR** : Automatic continuous tests Withstand voltage test→ Insulation resistance test **IRACW** : Automatic continuous tests Insulation resistance test→ Withstand voltage test **ACW** : Single test of Withstand voltage test **IR** : Single test of Insulation resistance test
	Transmission **MODE= ACWIR** CR LF Set automatic continuous tests mode, Withstand voltage test→ Insulation resistance test
11) MODE?	Reading of the set test mode contents
	Syntax **MODE?**
	Transmission **MODE?** CR LF
	Response **MODE=**[Parameter] CR LF [Parameter] **ACWIR** : Automatic continuous tests mode, Withstand voltage test→ Insulation resistance test **IRACW** : Automatic continuous tests mode, Insulation resistance test→ Withstand voltage test **ACW** : Single test mode Withstand voltage test **IR** : Single test mode Insulation resistance test
12) WVOLT=	Setting the test voltage of withstand voltage test
	Syntax **WVOLT=**[Parameter] [Parameter]:**0.00kV - 5.50kV**
	Transmission **WVOLT=5.00kV** CR LF Set the test voltage of withstand voltage test - 5.00kV.
13) WVOLT?	Reading of the test voltage of withstand voltage
	Syntax **WVOLT?**
	Transmission **WVOLT?** CR LF
	Response **WVOLT=**[Parameter] [Parameter]:**0.00kV - 5.50kV**

14) WHIGH=	Set the upper limit judgment value of withstand voltage test	
	Syntax	**WHIGH=**[Parameter] [Parameter]:**0.05mA - 99.99mA**
	Transmission	**WHIGH=10.00mA** CR LF Set the upper judgment value of withstand voltage test to 10.00mA.
15) WHIGH?	Reading of the upper limit judgment value of withstand voltage test	
	Syntax	**WHIGH?**
	Transmission	**WHIGH?** CR LF
	Response	**WHIGH=**[Parameter] CR LF [Parameter]:**0.05mA - 99.99mA**
16) WLOW=	Setting the lower limit judgment value of withstand voltage test	
	Syntax	**WLOW=**[Parameter] [Parameter]:Set to **OFF or 0.01mA - 50.00mA**
	Transmission	**WLOW=2.00mA** CR LF Set the lower judgment value of withstand voltage test to 2.00mA.
17) WLOW?	Reading of the lower judgment value of withstand voltage test	
	Syntax	**WLOW?**
	Transmission	**WLOW?** CR LF
	Response	**WLOW=**[Parameter] CR LF [Parameter]:Set to **OFF or 0.01mA - 50.00mA**
18) WTIMER=	Set the test time of withstand voltage test	
	Syntax	**WTIMER=**[Parameter] [Parameter]: Set to **OFF or 00:00.2s - 99:59.9s**
	Transmission	**WTIMER=01:00.0s** CR LF Set the test time of withstand voltage test to 60.0sec.
19) WTIMER?	Reading of the test time of withstand voltage test	
	Syntax	**WTIMER?**
	Transmission	**WTIMER?** CR LF
	Response	**WTIMER=**[Parameter] CR LF [Parameter]:et to **OFF or 00:00.2s - 99:59.9s**
20) WRTIMER=	Setting of the voltage rise time of withstand voltage test.	
	Syntax	**WRTIMER=**[Parameter] [Parameter]:Set to **00:00.1s - 01:59.9s**
	Transmission	**WTIMER=00:10.0s** CR LF Set the rise time of withstand voltage test to 10.0sec.
21) WRTIMER?	Reading of the voltage rise time of withstand voltage test.	
	Syntax	**WRTIMER?**
	Transmission	**WRTIMER?** CR LF
	Response	**WRTIMER=**[Parameter] CR LF [Parameter]:**00:00.1s - 01:59.9s**
22) WFTIMER=	Setting of the voltage fall time of withstand voltage test	
	Syntax	**WFTIMER=**[Parameter] [Parameter]:Set to **OFF or 00:00.1s - 01:59.9s**
	Transmission	**WFTIMER=01:00.0s** CR LF Set the test time of withstand voltage test time to 60.0sec.
23) WFTIMER?	Reading of the voltage fall time of withstand voltage test.	
	Syntax	**WFTIMER?**
	Transmission	**WFTIMER?** CR LF
	Response	**WFTIMER=**[Parameter] CR LF [Parameter]:Set to **OFF or 00:00.1s - 01:59.9s**

24) WFREQ=	Setting of the test voltage frequency of withstand voltage test
	Syntax **WFREQ=**[Parameter]
	Transmission **WFREQ?** CR LF
	Response **WFREQ=**[Parameter] CR LF [Parameter]: Set to **50Hz or 60Hz**
25) WFREQ?	Reading of the test voltage frequency of withstand voltage test
	Syntax **WFREQ?**
	Transmission **WFREQ?** CR LF
	Response **WFREQ=**[Parameter] CR LF [Parameter]: Set to **50Hz or 60Hz**
26) WMVOLT?	Reading of the output voltage measurement value during withstand voltage test.
	Syntax **WMVOLT?**
	Transmission **WMVOLT?** CR LF
	Response **WMVOLT=**[Parameter] CR LF [Parameter]:**0.00kV - 6.00kV**
27) CURRENT?	Reading of the leakage current measurement value during withstand voltage test.
	Syntax **CURRENT?**
	Transmission **CURRENT?** CR LF
	Response **CURRENT=**[Parameter] CR LF [Parameter]:**0.00mA - 99.99mA or OVER**
28) IVOLT=	Setting of the test voltage of insulation resistance test.
	Syntax **IVOLT=**[Parameter] [Parameter]:**500V,1000V**
	Transmission **IVOLT=1000V** CR LF Set the test voltage of insulation resistance test to 1000V
29) IVOLT?	Reading of the test voltage of insulation resistance test.
	Syntax **IVOLT?**
	Transmission **IVOLT?** CR LF
	Response **IVOLT=**[Parameter] CR LF [Parameter]:**500V,1000V**
30) IRANGE=	Setting of the resistance range of insulation resistance test.
	Syntax **IRANGE=**[Parameter] [Parameter]:**20.00MOHM,200.0MOHM,2000MOHM, AUTO**
	Transmission **IRANGE=AUTO** CR LF Set the resistance range as automatic range
31) IRANGE ?	Reading of the resistance range of insulation resistance test.
	Syntax **IRANGE ?**
	Transmission **IRANGE?** CR LF
	Response **IRANGE=**[Parameter] [Parameter]: **20.00MOHM, 200.0MOHM, 2000MOHM, AUTO**
32) IHIGH=	Setting of the upper limit judgment value of insulation resistance test.
	Syntax **IHIGH=**[Parameter] [Parameter]: Set to **OFF or 0.01MOHM - 9999MOHM**
	Transmission **IHIGH=100.0MOHM** CR LF Set the upper limit judgment value of the insulation resistance test to 100.0 MΩ.

33) IHIGH?	Reading of the upper limit judgment value of insulation resistance test
	Syntax **IHIGH?**
	Transmission **IHIGH?** CR LF
	Response **IHIGH=**[Parameter] CR LF [Parameter]: **OFF** or **0.01MOHM - 9999MOHM**
34) ILOW=	Setting of the lower judgment value of insulation resistance test.
	Syntax **ILOW=**[Parameter] [Parameter]: **0.01MOHM - 9999MOHM**
	Transmission **ILOW=0.20MOHM** CR LF Set the lower limit judgment value of insulation resistance test to 0.20MΩ.
35) ILOW?	Reading of the lower limit judgment value of insulation resistance test.
	Syntax **ILOW?**
	Transmission **ILOW?** CR LF
	Response **ILOW=**[Parameter] CR LF [Parameter]:**0.01MOHM - 9999MOHM**
36) IMASK=	Setting of the mask time of insulation resistance test.
	Syntax **IMASK=**[Parameter] [Parameter]:**00:00.1 - 01:59.9s** Note) Mask time cannot be set longer than test time (ITIMER).
	Transmission **IMASK=00:05.0s** CR LF Set the mask time of insulation resistance test to 5.0sec.
37) IMASK?	Reading of the mask time of insulation resistance test.
	Syntax **IMASK?**
	Transmission **IMASK?** CR LF
	Response **IMASK=**[Parameter] CR LF [Parameter]:**00:00.1 - 01:59.9s**
38) ITIMER=	Setting of the test time of insulation resistance test.
	Syntax **ITIMER=**[Parameter] [Parameter]:**OFF or 00:00.2 - 99:59.9s** Note) Test time cannot be set shorter than mask time (IMASK).
	Transmission **ITIMER=01:00.0s** CR LF Set the test time of insulation resistance test to 60.0sec.
39) ITIMER?	Reading of the test time of insulation resistance test.
	Syntax **ITIMER?**
	Transmission **ITIMER?** CR LF
	Response **ITIMER=**[Parameter] CR LF [Parameter]:**OFF or 00:00.2 - 99:59.9s**
40) RESISTANCE?	Reading of the measurement resistance value (displayed value) of insulation resistance test.
	Syntax **RESISTANCE?**
	Transmission **RESISTANCE?** CR LF
	Response **RESISTANCE=**[Parameter] CR LF [Parameter]:**0.00MOHM - 9999MOHM or UNDER or OVER**
41) IRVOLT?	Reading of the measured voltage value during insulation resistance test.
	Syntax **IRVOLT?**
	Transmission **IRVOLT?** CR LF
	Response **IRVOLT=**[Parameter] CR LF [Parameter]:**0.0V - 1076.0V or OVER**

42) DATA?

Reading of the test result.

Command used after the end of test.

Syntax **DATA?**

Transmission **DATA?** ␍␊

Response **DATA=**①,②,③,④,⑤,⑥,⑦,⑧,⑨,⑩␍␊ ACW-IR,IR-ACW,IR,ACW

DATA=①,②,③,④,⑤,⑥,⑦,⑧,⑨,⑩,⑦,⑧,⑨,⑩␍␊ IR-ACW-IR

Test mode

	ACW-IR or IR-ACW	ACW singlet test	IR single test
①	**JUDGE=**	**JUDGE=**	**JUDGE=**
②	**WJUDGE=**	**WJUDGE=**	**IJUDGE=**
③	**WVOLT=**	**WVOLT=**	**RESISTANCE=**
④	**CURRENT=**	**CURRENT=**	**IMTIME=**
⑤	**WMTIME=**	**WMTIME=**	**T**(Types of timer at end time)
⑥	Types of timer at end time	Types of timer at end time	
⑦	**IJUDGE=**		
⑧	**RESISTANCE=**		
⑨	**IMTIME=**		
⑩	**T** (Types of timer at end time)		

Parameter		Contents	
JUDGE=	GOOD	Pass	Synthetic judgment
	NG	Fail	
	NULL	Interrupts the test by STOP	
	PROTECT	Protection function operates during test	
WJUDGE=	GOOD	Pass	Withstand voltage test
	HIGH	During the upper limit judgment	
	LOW	During the lower limit judgment	
	NULL	Interrupts the test by STOP	
	HIGH LOW	Protection function operates during test	
WVOLT=	0.00kV	Measured value of the test voltage	
	NULL	Interrupts the test by STOP	
CURRENT=	0.00mA	Measured value of the leakage current	
	OVER	Measured value is OVER	
	NULL	Interrupts the test by STOP	
WMTIME=	00:00.0s	Remaining time of the timer after test end During WTIMER=OFF, Elapsed time	
Types of timer	R	End with the rise time	
	T	End with the test time	
	F	End with the fall time	
IJUDGE=	GOOD	Pass	Insulation resistance test
	HIGH	During the upper limit judgment	
	LOW	During the lower limit judgment	
	NULL	Abandon the test with STOP	
	HIGH LOW	Protection function is operating during the test	
RESISTANCE=	1000MOHM	Insulation resistance measurement value (displayed value)	
	OVER	Measurement value is over	
	UNDER	Measurement value is under	
	NULL	Abandon the test with STOP	
IMTIME=	00:00.0s	Remaining time of the test	

Response example of "DATA?"

ACW Test	During the GOOD judgment, **DATA=JUDGE=GOOD,WJUDGE=GOOD,WVOLT=1.00kV,CURRENT=0.05mA,WMTIME=00:00.0s,F** CR LF
	During the HIGH judgment, **DATA=JUDGE=NG,WJUDGE=HIGH,WVOLT=1.50kV,CURRENT=10.00mA,WMTIME=00:00.1s,T** CR LF
	When the test is interrupted (RESET), **DATA=JUDGE=NULL,WJUDGE=NULL,WVOLT=NULL,CURRENT=NULL,WMTIME=NULL,T** CR LF
	When protection works, **DATA=JUDGE=PROTECT,WJUDGE=HIGH LOW,WVOLT=NULL,CURRENT=NULL,WMTIME=NULL,T** CR LF
IR Test	During the GOOD judgment, **DATA=JUDGE=GOOD,IJUDGE=GOOD,RESISTANCE=40.0MOHM,IMTIME=00:00.0s,T** CR LF
	During the LOW judgment, **DATA=JUDGE=NG,IJUDGE=LOW,RESISTANCE=20.0MOHM,IMTIME=00:3.0s,T** CR LF
	When the test is interrupted (RESET), **DATA=JUDGE=DATA=JUDGE=NULL,IJUDGE=NULL,RESISTANCE=NULL,IMTIME=NULL,T** CR LF
	When protection works, **DATA=JUDGE= PROTECT,IJUDGE=HIGH LOW,RESISTANCE=NULL,IMTIME=NULL,T** CR LF
ACW－IR Test	During the GOOD judgment, **DATA=JUDGE=GOOD,WJUDGE=GOOD,WVOLT=0.12kV,CURRENT=0.57mA,WMTIME=00:00.0s,F,IJUDGE=GOOD,RESISTANCE=0.20MOHM,IMTIME=00:00.0s,T** CR LF
	During the ACW HIGH judgment, **DATA=JUDGE=NG,WJUDGE=HIGH,WVOLT=2.10kV,CURRENT=10.18mA,WMTIME=00:00.1s,R,IJUDGE=NULL,RESISTANCE=NULL,IMTIME=NULL,T** CR LF
	During the IR LOW judgment, **DATA=JUDGE=NG,WJUDGE=GOOD,WVOLT=0.12kV,CURRENT=0.57mA,WMTIME=00:00.0s,F,IJUDGE=LOW,RESISTANCE=0.20MOHM,IMTIME=00:03.0s,T** CR LF
IR－ACW Test	During the GOOD judgment, **DATA=JUDGE=GOOD,WJUDGE=GOOD,WVOLT=0.12kV,CURRENT=0.57mA,WMTIME=00:00.0s,F,IJUDGE=GOOD,RESISTANCE=0.20MOHM,IMTIME=00:00.0s,T** CR LF
	At the IR LOW judgment, **DATA=JUDGE=NG,WJUDGE=NULL,WVOLT=NULL,CURRENT=NULL,WMTIME=NULL,T,IJUDGE=LOW,RESISTANCE=0.20MOHM,IMTIME=00:03.0s,T** CR LF
	During the ACW HIGH judgment, **DATA=JUDGE=NG,WJUDGE=HIGH,WVOLT=2.10kV,CURRENT=10.18mA,WMTIME=00:00.1s,R,IJUDGE=GOOD,RESISTANCE=0.20MOHM,IMTIME=00:00.0s,T** CR LF
ACW－IR Test or IR－ACW Test	When the test is interrupted (RESET), **DATA=JUDGE=NULL,WJUDGE=NULL,WVOLT=NULL,CURRENT=NULL,WMTIME=NULL,T,IJUDGE=NULL,RESISTANCE=NULL,IMTIME=NULL,T** CR LF
	When protection is activated, **DATA=JUDGE=PROTECT,WJUDGE=HIGH LOW,WVOLT=NULL,CURRENT=NULL,WMTIME=NULL,T, IJUDGE=HIGH LOW,RESISTANCE=NULL,IMTIME=NULL,T** CR LF

※Not completed data becomes 'null', the completed data is saved.

43) DATA2?	Reading each measured value during test.
	Syntax **DATA2?**
	Transmission **DATA2?** CR LF
	Response DATA2=[Parameter] CR LF **[Parameter]:** **・When test mode is ACW-IR or IR-ACW, W,①,②,I,③,④** CR LF **① Withstand voltage test Output voltage measured value(kV)** **0.00 - 6.00** **② Insulation resistance test Leakage current measured value(mA)** **00.00 - 99.99 or OVER** **③ Withstand voltage test Measured resistance value(displayed value)(MOHM)** **00.00 - 49.90** **018.0 - 999.0** **0180 - 9990** **UNDER** **OVER** **④ Insulation resistance test Measured output voltage value(V)** **0000.0 - 1076.0 or OVER** **・When test mode is single ACW test ACW,①,②** CR LF **① Withstand voltage test Measured output voltage value(kV)** **0.00 - 6.00** **② Withstand voltage test Leakage current measured value(mA)** **00.00 - 99.99 又は OVER** **・When test mode is single IR test IR,①,②** CR LF **① Insulation resistance test Measured insulation resistance value (displayed value)(MOHM)** **00.00 - 49.90** **018.0 - 999.0** **0180 - 9990** **UNDER** **OVER** **② Insulation resistance test Measured output voltage value(V)** **0000.0 - 1076.0 or OVER** **Response example** **DATA2=W,0.00,00.00** **DATA2=I,00.00,0000.0** **DATA2=W,0.49,04.83,I,0.101,0029.5** **DATA2=W,0.89,08.77,I,UNDER,0029.4**

44) SET=

Parameter of test conditions are set.

Command order, replacement not possible

Syntax **SET=**

Transmission **SET=**①,②,③,④,⑤,⑥,⑦,⑧,⑨,⑩,⑪,⑫,⑬,⑭,⑮,⑯,⑰,⑱,⑲,⑳[CR][LF]

	Test mode			
	ACW-I or IR-ACW	ACW single test	IR single test	IR-ACW-IR
①	**MODE=**	**MODE=**	**MODE=**	**MODE=**
②	**WVOLT=**	**WVOLT=**	**IVOLT=**	**WVOLT=**
③	**WHIGH=**	**WHIGH=**	**IRANGE=**	**WHIGH=**
④	**WLOW=**	**WLOW=**	**IHIGH=**	**WLOW=**
⑤	**WTIMER=**	**WTIMER=**	**ILOW=**	**WTIMER=**
⑥	**WRTIMER=**	**WRTIMER=**	**IMASK=**	**WRTIMER=**
⑦	**WFTIMER=**	**WFTIMER=**	**ITIMER=**	**WFTIMER=**
⑧	**WFREQ=**	**WFREQ=**		**WFREQ=**
⑨	**IVOLT=**			**IVOLT=**
⑩	**IRANGE=**			**IRANGE=**
⑪	**IHIGH=**			**IHIGH=**
⑫	**ILOW=**			**ILOW=**
⑬	**IMASK=**			**IMASK=**
⑭	**ITIMER=**			**ITIMER=**
⑮				**IVOLT=**
⑯				**IRANGE=**
⑰				**IHIGH=**
⑱				**ILOW=**
⑲				**IMASK=**
⑳				**ITIMER=**

For detail of each command, refer to the respective command descriptions.

Transmission example

SET=MODE=ACWIR,WVOLT=2.50kV,WHIGH=20.00mA,WLOW=OFF,WTIMER=00:10.0s,WRTIMER=00:05.0s,WFTIMER=00:10.0s,WFRQ=60Hz,IVOLT=500V,IRANGI=AUTO,IHIGH=OFF,ILOW=10.00MOHM,IMASK=00:01.0s,ITIMER=00:50.0s [CR][LF]

45) SET?

Parameter of test conditions are read out.

Syntax **SET?**

Transmission **SET?**[CR][LF]

Response **SET?=** ①,②,③,④,⑤,⑥,⑦,⑧,⑨,⑩,⑪,⑫,⑬,⑭,⑮,⑯,⑰,⑱,⑲,⑳[CR][LF]

	Test mode			
	ACW-IR or IR-ACW	ACW single test	IR single test	IR-ACW-IR
①	**MODE=**	**MODE=**	**MODE=**	**MODE=**
②	**WVOLT=**	**WVOLT=**	**IVOLT=**	**WVOLT=**
③	**WHIGH=**	**WHIGH=**	**IRANGE=**	**WHIGH=**
④	**WLOW=**	**WLOW=**	**IHIGH=**	**WLOW=**
⑤	**WTIMER=**	**WTIMER=**	**ILOW=**	**WTIMER=**
⑥	**WRTIMER=**	**WRTIMER=**	**IMASK=**	**WRTIMER=**
⑦	**WFTIMER=**	**WFTIMER=**	**ITIMER=**	**WFTIMER=**
⑧	**WFREQ=**	**WFREQ=**		**WFREQ=**
⑨	**IVOLT=**			**IVOLT=**
⑩	**IRANGE=**			**IRANGE=**
⑪	**IHIGH=**			**IHIGH=**
⑫	**ILOW=**			**ILOW=**
⑬	**IMASK=**			**IMASK=**
⑭	**ITIMER=**			**ITIMER=**
⑮				**IVOLT=**
⑯				**IRANGE=**
⑰				**IHIGH=**
⑱				**ILOW=**
⑲				**IMASK=**
⑳				**ITIMER=**

For detail of each command, refer to the respective command descriptions.

Response example

SET=MODE=ACWIR,WVOLT=2.50kV,WHIGH=20.00mA,WLOW=OFF,WTIMER=00:10.0s,WRTIMER=5.0s,WFTIMER=00:10.0s,WFREQ=60Hz,IVOLT=500V,IRANGE=AUTO,IHIGH=OFF,ILOW=50.00MOHM,IMASK=00:1.0s,ITIMER=00:50.0s [CR][LF]

46) MEMORY=

Setting of the Memory No.

Syntax **MEMORY=**[Parameter]
[Parameter]:**1 - 10**

Transmission **MEMORY=5** CR LF
Memory No. Is specified to “5”.

47) MEMORY?

Memory No. Is read out.

Syntax **MEMORY?**

Transmission **MEMORY?**CR LF

Response **MEMORY=8** CR LF
Memory No. “8” is read out.

48) MEM□=

Test mode and parameter are set to the specified memory No. Command order replacement not possible.

Syntax **MEM**[Memory No.]**=**①,②,③,④,⑤,⑥,⑦,⑧,⑨,⑩,⑪,⑫,⑬,⑭,⑮,⑯,⑰,⑱,⑲,⑳CR LF
[Memory No.]:**1 - 10**

	Test mode			
	ACW-IR or IR-ACW	ACW single test	IR single test	IR-ACW-IR
①	**MODE=**	**MODE=**	**MODE=**	**MODE=**
②	**WVOLT=**	**WVOLT=**	**IVOLT=**	**WVOLT=**
③	**WHIGH=**	**WHIGH=**	**IRANGE=**	**WHIGH=**
④	**WLOW=**	**WLOW=**	**IHIGH=**	**WLOW=**
⑤	**WTIMER=**	**WTIMER=**	**ILOW=**	**WTIMER=**
⑥	**WRTIMER=**	**WRTIMER=**	**IMASK=**	**WRTIMER=**
⑦	**WFTIMER=**	**WFTIMER=**	**ITIMER=**	**WFTIMER=**
⑧	**WFREQ=**	**WFREQ=**		**WFREQ=**
⑨	**IVOLT=**			**IVOLT=**
⑩	**IRANGE=**			**IRANGE=**
⑪	**IHIGH=**			**IHIGH=**
⑫	**ILOW=**			**ILOW=**
⑬	**IMASK=**			**IMASK=**
⑭	**ITIMER=**			**ITIMER=**
⑮				**IVOLT=**
⑯				**IRANGE=**
⑰				**IHIGH=**
⑱				**ILOW=**
⑲				**IMASK=**
⑳				**ITIMER=**

For detail of each command, refer to the respective command descriptions.

Transmission example MEM3=MODE=ACWIR, WVOLT=2.50kV, WHIGH=20.00mA, WLOW=OFF, WTIMER=00:10.0s, WRTIMER=00:05.0s, WFTIMER=00:10.0s, WFREQ=60Hz, IVOLT=500V, IRANGE=AUTO, IHIGH=OFF, ILOW=10.00MOHM, IMASK=00:01.0s, ITIMER=00:50.0s CR LF

49) MEM□?

Reading of test mode of memory No. and parameter.

Syntax **MEM[Memory No.]?**
[Memory No.]:**1 - 10**

Transmission **MEM**[Memory No.]**?**CR LF

Response **MEM**[Memory No.]**=**①,②,③,④,⑤,⑥,⑦,⑧,⑨,⑩,⑪,⑫,⑬,⑭,⑮,⑯,⑰,⑱,⑲,⑳CR LF

	Test mode			
	ACW-IR or IR-ACW	ACW single test	IR single test	IR-ACW-IR
①	**MODE=**	**MODE=**	**MODE=**	**MODE=**
②	**WVOLT=**	**WVOLT=**	**IVOLT=**	**WVOLT=**
③	**WHIGH=**	**WHIGH=**	**IRANGE=**	**WHIGH=**
④	**WLOW=**	**WLOW=**	**IHIGH=**	**WLOW=**
⑤	**WTIMER=**	**WTIMER=**	**ILOW=**	**WTIMER=**
⑥	**WRTIMER=**	**WRTIMER=**	**IMASK=**	**WRTIMER=**
⑦	**WFTIMER=**	**WFTIMER=**	**ITIMER=**	**WFTIMER=**
⑧	**WFREQ=**	**WFREQ=**		**WFREQ=**
⑨	**IVOLT=**			**IVOLT=**
⑩	**IRANGE=**			**IRANGE=**
⑪	**IHIGH=**			**IHIGH=**
⑫	**ILOW=**			**ILOW=**
⑬	**IMASK=**			**IMASK=**
⑭	**ITIMER=**			**ITIMER=**
⑮				**IVOLT=**
⑯				**IRANGE=**
⑰				**IHIGH=**
⑱				**ILOW=**
⑲				**IMASK=**
⑳				**ITIMER=**

For detail of each command, refer to the respective command descriptions.

Response example MEM3=MODE=ACWIR, WVOLT=2.50kV, WHIGH=20.00mA, WLOW=OFF, WTIMER=00:10.0s, WRTIMER=00:05.0s, WFTIMER=00:10.0s, WFREQ=60Hz, IVOLT=500V, IRANGE=AUTO, IHIGH=OFF, ILOW=10.00MOHM, IMASK=00:01.0s, ITIMER=00:50.0s CR LF

8. Error code and solution tips

Error code	Error contents and countermeasures
ERROR=1	Command format cannot be recognized and the characters are wrong. Example) STAART、STAT Correct the character to **START**
ERROR=2	Parameter is out of the valid range Example) **ITIMER=9999** Put it in between **00:00.2 - 99:59.9**
ERROR=3	Trying to set the parameter in the condition where setting is not possible. Example) The cause is in 850A other than communication. Refer to the 850A operation manual "13. Error message".
TEST	A setting command other than STOP and WVOLT= was performed during the test and judgment output.
ERROR=6	During **ONLINE=OFF, START** command is received (Switch **ONLINE=ON**) During REMOTE, **ONLINE=ON** command is received (Cancel REMOTE) During REMOTE, Setting command received, while MEM SET is other than 0. (Set MEM SET to 0) During REMOTE, **MEMORY=**command is received
ERROR=8	Command transmission is performed during test condition setting. Example) Command transmission is not possible during setting by the front panel operation. Finish the setting and the turn it in READY state.
ERROR= 9	Command is not appropriate. Example) ・Even when it is not yet measured, **DATA?** Command is received. When no memory No. is set, **MEMORY ?** Command is received.

During Protection function operation,

PROTECTION	Countermeasures
Error Discharge	When the capacity of the test specimen is large, discharge is not possible and there is a case where high voltage remains. When **DATA?** is received at this state, IJUDGE=PROTECT is returned to the host. Besides, if **STOP** command is received then ERROR=3 is returned to the host. **Countermeasure** Leave it alone for some time and continue the discharge. When the discharge is completed, it is possible that the **STOP** command or error display in STOP switch is released.
Interlock Protection	Even when command is sent in INTERLOCK state, ERROR=3 is returned to the host. **Countermeasure** Release the INTER LOCK and make **STOP** command or press STOP switch.
Over Heat Protection	It occurs during withstand voltage test, when the internal components are in the overheated state. When **DATA?** is received at this state, WJUDGE=PROTECT is returned to the host. Besides, if STOP command is received then ERROR=3 is returned to the host. **Countermeasure** There is a possibility of internal components getting overheated during the test for a long time. Wait for a while at the power on state till the heat is dissipated. When the heat dissipation is completed, it is possible that the STOP command or error display in STOP switch is released.
Power Amp Protection	It happens when internal part is abnormal or damaged. On this state, **DATA?** is received, JUDGE=PROTECT is returned to host. **Countermeasure** Switch off the power sooner as soon as possible. 850A might malfunctioned. Contact the distributor or the nearest office of Tsuruga Electric Corporation.
Test Voltage Protection	During withstand voltage test, it happens when the output voltage is less than 50% of the set voltage. On this state, **DATA?** Command is received, JUDGE=PROTECT is returned to the host. **Countermeasures** Remove high voltage cable and undertake a test, and confirm if the same error will be displayed or not. ・The error is repeated, switch off the power sooner as possible. 850A might be malfunctioned. Contact the distributor or the nearest office of Tsuruga Electric Corporation soon. ・If the error doesn't occur, confirm the wiring of high voltage cable.
FAN ERROR Protection	This happens when the FAN is abnormal or malfunctioned, because if its life span. **Countermeasure** Switch off the power as soon as possible. FAN might be malfunctioned, contact the distributor or the nearest office of Tsuruga Electric Corporation.

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