H.V Scanning Unit

TOS9020

INSTRUCTION MANUAL

DANGER

HIGH VOLTAGE

- **This H.V Scanning Unit deals with a dangerous high voltage.**
- **Any incorrect handling may cause death.**
- **Read Section3 "WARNINGS" in this manual to prevent accident.**
- **This instruction manual, together with the manual for the TOS9000 AUTOMATIC W/I Tester, should be placed within the reach of the operator so that he or she may refer to them whenever.**

KIKUSUI

Part No. Z1-212-620, IB002452

TOS Series Errata

KIKUSUI changed models in the following table to new models.
If the previous model names are described in this manual, read this manual replacing the previous model names with new model names.

Product	Previous Model	New Model
Resistance Box /UL	SPEC83903	RL01-TOS
Remoto Control Box	913A	RC01-TOS
Remoto Control Box	914A	RC02-TOS
H.V Test Probe	HTP-1.5A	HP01A-TOS
H.V Test Probe	HTP-3A	HP02A-TOS
H.V Test Probe	HP01-TOS	HP01A-TOS
H.V Test Probe	HP02-TOS	HP02A-TOS
High Voltage Test Leadwires	HTL-1.5W	TL01-TOS
High Voltage Test Leadwires	HTL-3W	TL02-TOS
High Voltage Test Leadwires	HTL-1.5WH	TL03-TOS
High Voltage Test Leadwires	HTL-1.5R	TL04-TOS
High Voltage Test Leadwires	HTL-1.5I	TL05-TOS
High Voltage Test Leadwires	HTL-1.5D	TL05-TOS
Warning Light Unit	9202	PL01-TOS
Warning Light Unit	9202S	PL01-TOS
Buzzer Unit	9203	BZ01-TOS
Buzzer Unit	9203S	BZ01-TOS

KIKUSUI ELECTRONICS CORP.

Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.
(Revision should be applied to items indicated by a check mark ☑.)

☐ Input voltage

The input voltage of this product is _____ VAC,
and the voltage range is _____ to _____ VAC. Use the product within this range only.

☐ Input fuse

The rating of this product's input fuse is _____A, _____VAC, and _____.

WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

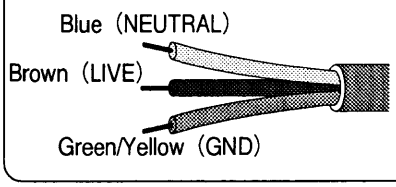
☐ AC power cable

The product is porvided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

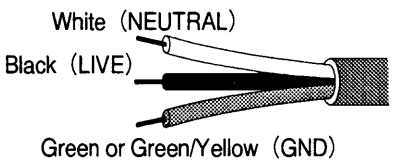
WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.

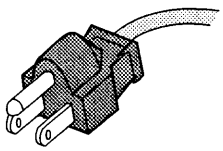
☐ Without a power plug



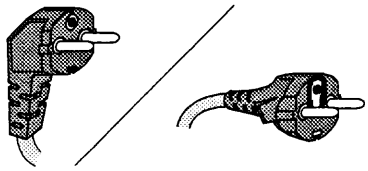
☐ Without a power plug



☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable.
For further information, contact your Kikusui agent.

☐ Another Cable _____

 Kikusui Part No. Z9-000-027 IB001681

KIKUSUI

- To supervisor in charge of operation -

(1) If the operator does not read the language used in this manual, translate the manual into appropriate language.

(2) Help the operator in understanding this manual before operation.

(3) Keep this manual near the unit for easy access of the operator together with the manual for the TOS9000 AUTOMATIC W/I Tester.

- Receiving inspection -

Prior to the shipment from our factory, the tester has been subjected to electric and mechanical-testing and guaranteed of satisfactory quality and performance. Nevertheless, you are kindly requested to make a receiving inspection to see if the tester has any in-transit damage. If you find any, please inform our local dealer of such a damage.

- For your own safety (How to avoid electrification) -

(1) While the tester is generating the output, do not touch the following areas, or else, you will be electrified, and run the risk of death by electric shock.

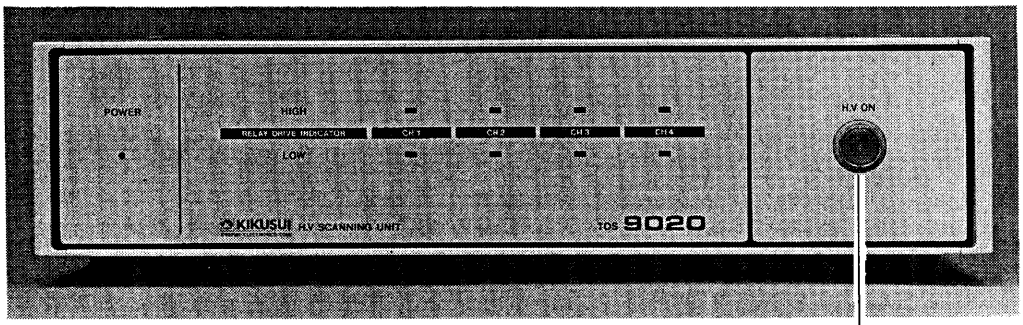
- *the output terminal*
- *the test lead-wire connected to the output terminal*
- *the Device Under Test (D.U.T.)*
- *any part of the tester, which is electrically connected to the output terminal, and*
- *the same part as above immediately after the output has been cut off. (in case of insulation resistance test)*

(2) Also, electric shock or accident may arise in the following cases:

- *the tester being operated without grounding*
- *if the gloves for electrical job are not used*
- *approach to any part connected to the output terminal while the power of the tester is turned on*
- *the same action as above immediately after the power of tester has been turned off. (in case of insulation resistance test)*

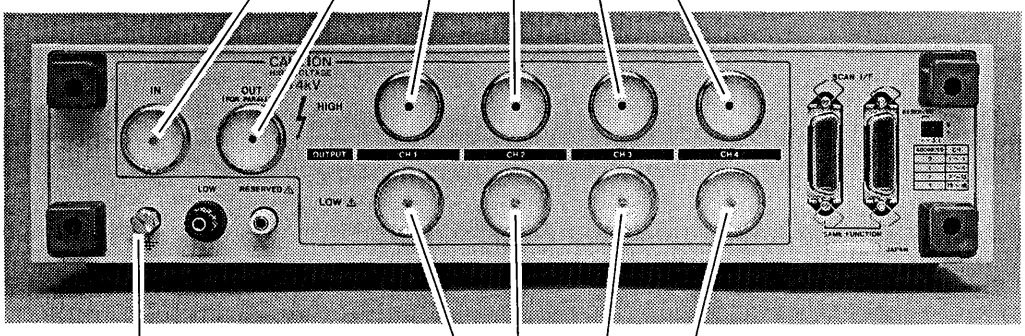
– ATTENTION –

Pay attention to the following instructions and those warnings given in the section 3 "WARNINGS" as well.



Lighting of the H.V ON lamp means delivery of the high test voltage—"Danger!"

These terminals deal with the high test voltage—"Danger!"



These terminals deal with the high test voltage—"Danger!"

Be sure to ground the safety GND terminal to the earth. Securely connect the grouding wire by using an appropriate tool.

Contents

1. GENERAL DESCRIPTION

The TOS9020 H.V Scanning Unit is an optional device for the TOS9000 AUTOMATIC W/I Tester. The TOS9020 receives a high test voltage from TOS9000 and distributes it to a multiple number of test points. Being controlled by the TOS9000, the TOS9020 provides the following functions:

(1) Multi-scanning function

Having four channels, the TOS9020 can provide a multi-scanning function such that any two of the four test points can be selected. You can execute a withstanding voltage test (W test) or an insulation resistance test (I test) among any two selected points in both polarity.

(2) Single-scanning function

By selecting a certain test point of the Device Under Test (D. U. T.) as a low voltage point (common point), up to four high voltage points can be scanned with reference to the common point with a single unit of TOS9020.

(3) Expansion by parallel connection

Up to four TOS9020 units can be connected in parallel, thereby increasing the number of channels up to 16.

(4) Contact check function

Contacting between the output terminal and the test point of each channel can be checked.

Note: When the TOS9020 is used in the single-scanning mode of (2), however, contacting of the low voltage side cannot be checked.

These functions of the TOS9020 can be utilized for efficient and labor-saving and yet reliable tests of electrical and electronic devices and components which have a multiple number of test points.

Caution!

When the TOS9000 alone is used, tests can be done with test voltages of up to 5kV which is the maximum output voltage of the TOS9000. When the TOS9000 and the TOS9020 are used in conjunction, on the other hand, tests can be done with test voltages of only up to 4kV which is the maximum dielectric strength of the test setup (cables and connectors). Exercise care so that no test voltages higher 4kV are delivered to the TOS9020 this test setup is used.

WARNING

Danger! High Voltage!

The TOS9020 deals with a hazardously high test voltage of 4kV. Never touch the test cables, connectors, D.U.T., and other exposed objects which are charged to the high voltage. Be extremely careful so that the high test voltage is never delivered accidentally. Enclose the test area with rope fences or other appropriate means to inhibit access to it by unauthorized persons. Be sure to fully and constantly maintain an utter safety against electrical shock hazards.

2. SPECIFICATIONS

Maximum Test Voltage:	4kV AC
Number of Channels/Unit:	4
Maximum Parallel Units:	4 units (16 channels)
Indicators:	LEDs as follows
• H.V ON Lamp:	Lights during test voltage delivery.
• POWER LED:	Lights being linked to POWER switch of TOS9000.
• RELAY DRIVE INDICATOR LEDs:	Light to indicate that the relays of selected channel are ON.
Unit Number Switches (Address Switches):	DIP switches to set a unit number (address number) for each of up to four units connected in parallel. Available unit numbers are 0 to 3 (set at 0 when the unit is shipped).
Contact Check Function:	• In the multi-scanning mode, contacting of both HIGH-line channel and LOW-line channel are checked.
	• In the single-scanning mode, contacting of only the HIGH-line channel is checked.
Dimensions:	430 W × 99 H × 370 D mm 16.93W × 3.90H × 1.57D in.
(Maximums):	(430 W × 114 H × 415 D mm) (16.93W × 4.53H × 16.14D in.)
Weight:	Approx. 6kg (13.2 lbs.)

Accessories:

	Q'ty
• 24P Amphenol connector (with cable, approx. 1m or 3.3 ft. long)	1
• H.V shielded cable (with connector, for connection with TOS9000, approx. 1m or 3.3 ft. long)	1
• Instruction manual	1
• "DANGER HIGH VOLTAGE" warning stickers	2
• Channel stickers	2 sets
• HC01-TOS cable (H.V shielded cable for parallel connection of TOS9020 units, approx. 0.5m or 1.6 ft. long)	1
• HC03-TOS cables (H.V shielded cables to connect TOS9020 unit to tested object, approx. 2m or 6.6 ft. long)	4 sets
• Wire for connection between the LOW terminal and the shield of H.V shielded cable. (with a crimp-type terminal and a connector)	1

Options

- BH2M-KSG rack mount brackets (JIS type)

3. WARNINGS

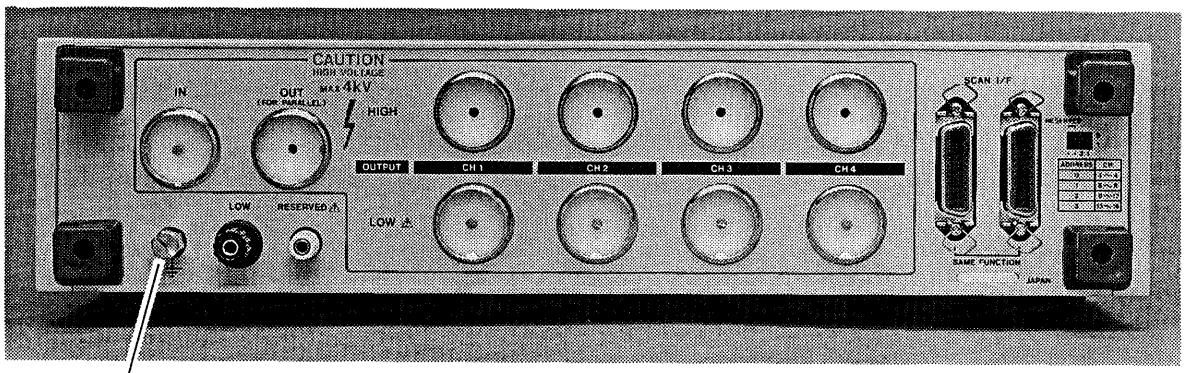
The tester supplies high voltage up to 4kV to the outside connection. Thus any incorrect handling of the tester may bring the risk of death to the operator. For safe operation of the tester, strictly observe the following instructions.

1. Electrification

Be sure to wear a pair of rubber gloves for electrical job, before operating the tester, to prevent an electric shock.

2. Grounding:

The protective grounding terminal, on the rear of the tester casing, shall be positively grounded using the applicable tool. If not properly grounded, the casing of this tester is charged with high voltage when the power is short-circuited to the ground or conveyer or any devices connected to the ground or to the commercial power line (refer to Note). It is very risky that anyone who touches the casing under such a condition will be subject electric shock.



Protective GND terminal

Figure 3.1

Note: Generally a commercial power line means a line leading to the AC cord socket of the tester, from which the rated power is supplied into the tester. This manual also covers the power supply line from a private power generator.

3. **Connection of test lead-wire on GND side:**

The LOW-line test cable which is an accessory of the TOS9000 is also used for the TOS9020. When using this cable, securely connect it to the LOW terminal (black binding-post terminal) on the TOS9020 rear panel in the same manner as connecting to the TOS9000.

Every time the unit is used, check if the lead wire is not damaged or disconnected. Be sure to connect it securely. If the connection is incomplete, it is hazardous that the entire D.U.T. may be charged with high voltage.

When connecting the TOS9020 to the D.U.T., connect the LOW-line test cable first and the HIGH-line test cable last.

4. **Connection of test cable on high voltage output side:**

When using the LOW-line test cable which accompanies the TOS9000, be sure to connect it first of all.

> **Caution!**
>
> ***Before connecting the HIGH-line test cable, make it double sure that the POWER switch of the TOS9000 is OFF.***

Connect the H.V test cables (HC03-TOS) to the D.U.T. as shown in Figure 3.2. Make it sure to connect the LOW-line test cable first and the HIGH-line test cable next.

Be sure to connect the outer shielding of the cable to the LOW terminal (black binding post) on the rear panel, as shown in Figure 3.3.

Lastly, securely connect the IN terminal of the TOS9020 to the H.V terminal on the rear panel of the TOS9000 with the H.V shielded cable which accompanies the TOS9020, or to the OUT terminal of other TOS9020 (if two or more TOS9020 units are used in parallel) with the HC01-TOS cable which accompanies the TOS9020.

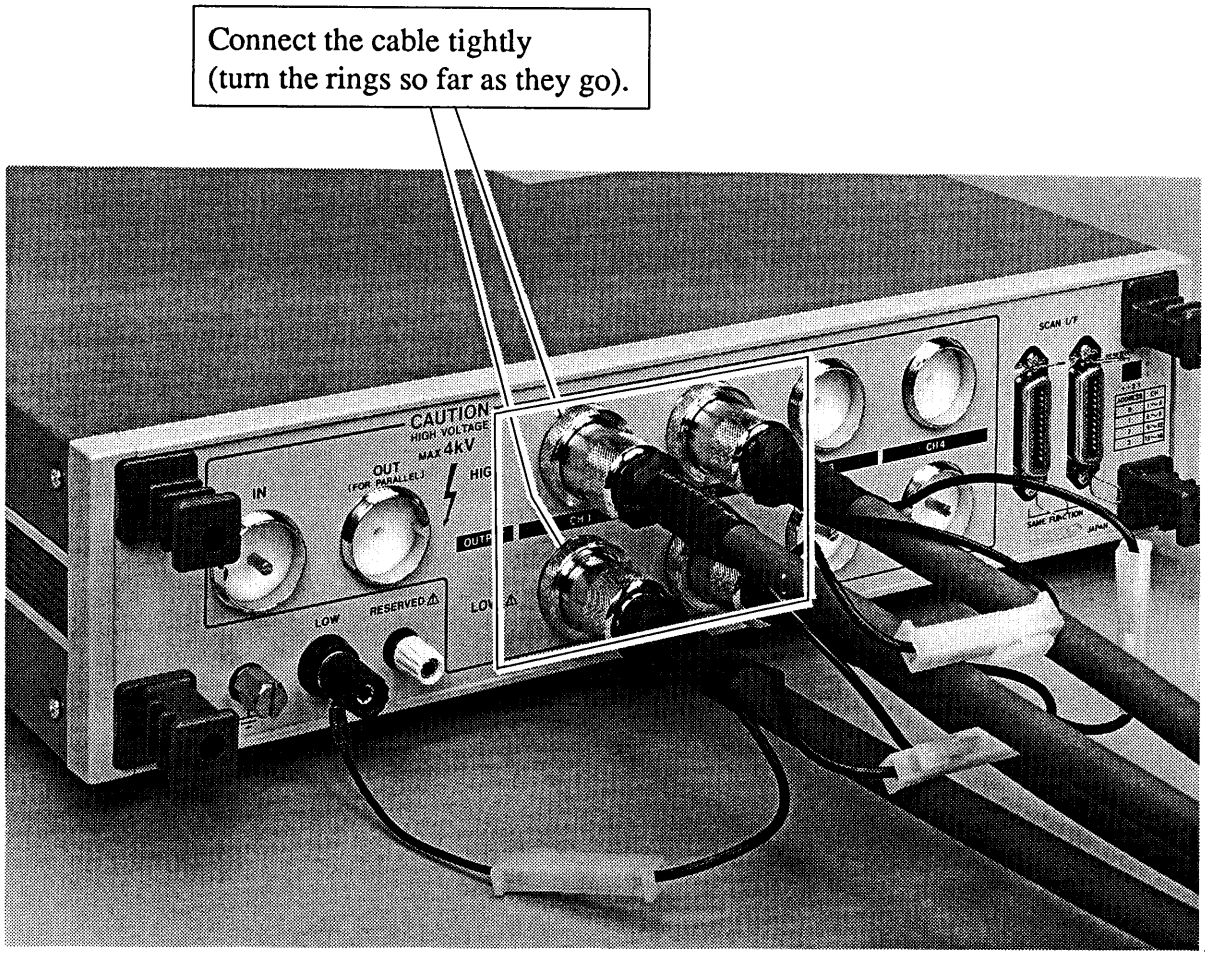
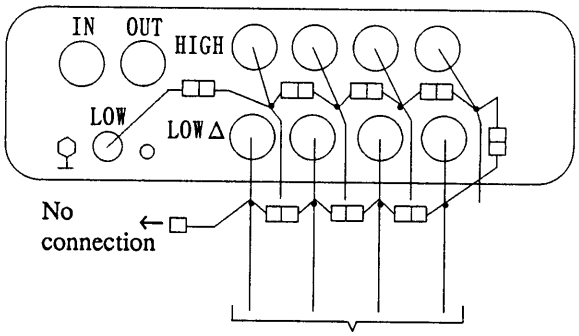
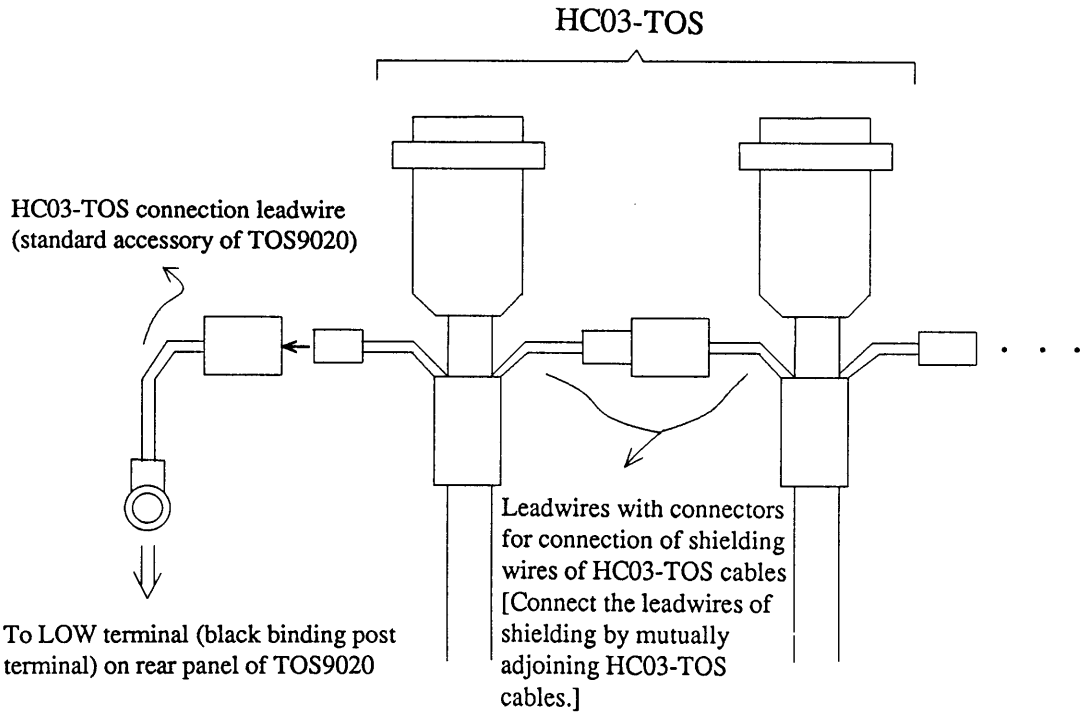


Figure 3.2

Rear panel of TOS9020



HC03-TOS cables (assuming that all of the four channels are used)



Caution!

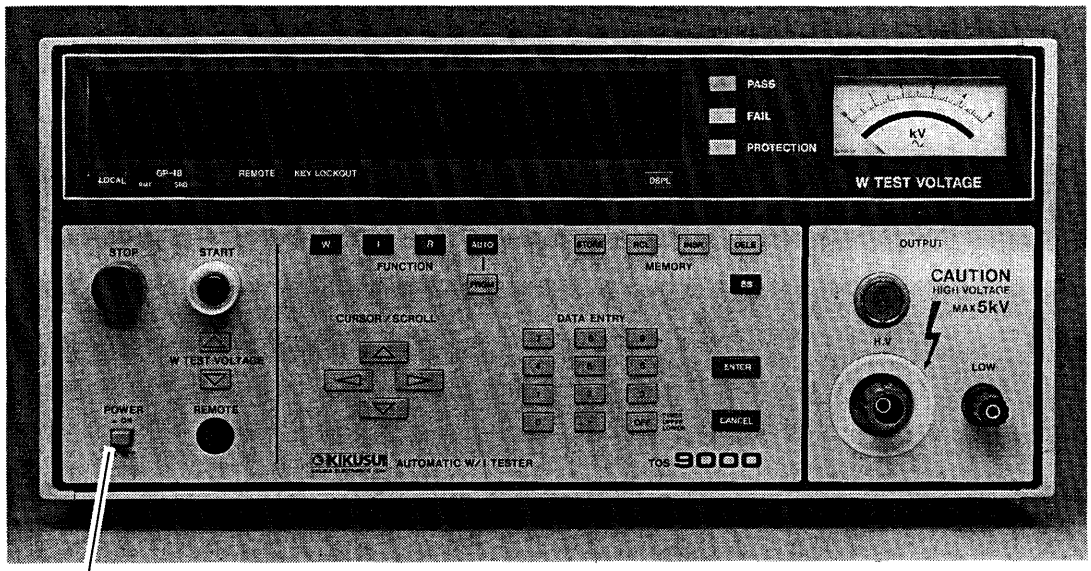
Be sure to connect the shielding wires of all of the HC03-TOS cables to the LOW terminal (black binding post terminal) through their leadwires and connectors.

Figure 3.3

5. Suspension of testing:

The power switch of the TOS9000 AUTOMATIC W/I Tester shall be turned off if it is not in use for some time or the operator is to leave from the tester.

TOS9000 AUTOMATIC W/I Tester



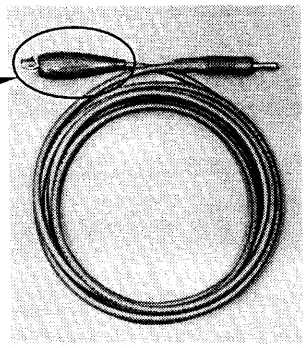
POWER switch

Figure 3.4

6. Critical areas of the tester under operation:

It is dangerous to touch such high voltage areas as the D.U.T., the test lead wire, probe, and output terminal while the tester is under operation.

Never touch this area



NEVER touch the alligator of the test lead wire and the vinyl-cover of the clip (accessory of the TOS9000) because they are NOT insulation proof.

Figure 3.5

Be careful even after turning off the test voltage!

7. Confirmation on completion of testing:

You may touch the D.U.T. and the high-voltage areas (test cables, probe or output terminal) for correction of the wiring or any other purpose provided that the following confirmation has been made:

The power switch of the TOS9000 is turned off.

In the case of insulation resistance test, D.U.T. is charged after testing. Therefore, a particular attention must be paid to the succeeding paragraphs, 3-8 and 3-9.

— Cautions in electric charging in insulation resistance test —

8. Electric charging:

In case of insulation resistance test, the D.U.T. and the capacitor, test lead-wire, probe and output terminal, embodied in the tester, are charged with high voltage.

And it takes some time to discharge such an electric charge after the power has been cut off.

Accordingly, you should not touch such areas to prevent electric shock for a while after the power has been turned off.

9. Confirmation on discharge of electric charge:

The time required to discharge electric charge depends on the characteristic of the D.U.T. and the test voltage. Suppose that the high-voltage areas such as the D.U.T. and the test lead-wire are an equivalent circuit and that it can be expressed as a capacity of 0.01μF and a parallel resistance of 100MΩ, then the time required to attenuate the voltage of the D.U.T. down to 30V will be about 3.5 sec. at the test voltage of 1000V, and about 2.8 sec. at 500V. If the time constant of the D.U.T. is known, the attenuation time down to 30V, after the power has been cut off, of the D.U.T. can be determined by multiplying the attenuation time given above with such a time constant.

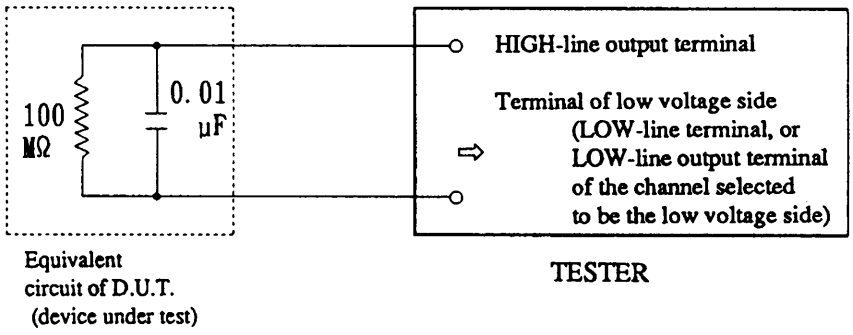


Figure 3.6

10. Other precautions

- Do not short-circuit the high voltage output with the ground or a conveyer or any device connected to the ground, or with the commercial power-line around tester location. Such a short-circuit may cause high-voltage charging on the unit casing, it is very dangerous. However, such a risky condition will not arise if only the casing has been grounded. The grounded casing will not be electrically charged nor will cause the damage on the unit even when the Low terminal has been short-circuited with the high-voltage terminal. The protective grounding terminal shall be positively grounded using applicable tool.

- If the high voltage output is shorted to the LOW terminal (or other object which is connected to the LOW terminal),noise which may cause interference to nearby electronic systems may be produced. To reduce the noise, connect the resistors (1kΩ, 3W, Impulse Dielectric Withstanding Voltage:30kV), at positions as colse to the D.U.T. as possible, between the high-voltage-side cable and the D.U.T. and between the low-voltage-side cable and the D.U.T. as shown in Figure 3.7. When the resistors are connected as above, due to the voltage drops across the resistors, the voltage at the D.U.T.will be slightly lower than the voltage at the output terminal. For example, if the output current is 10mA, the voltage at the D.U.T.will be lower by approximately 20V than that at the output terminal)

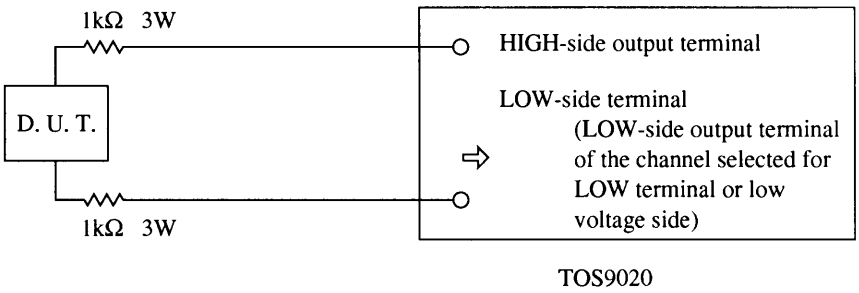


Figure 3.7

- The chassis of TOS9020 is connected to that of TOS9000 through the 24-pin Amphenol connector. Be sure to lock the connector. Before start using the test setup, check that the chassis of the TOS9020 is electrically connected to that of the TOS9000.

- Exercise care so that the high test voltage is not shorted to the RESERVED terminal ⑦ (refer to Chapter 4.2 "Description of Rear Panel") to the metallic shell of a connector, or to the braided shielding wire of a cable. Serious damage or hazard may result if shorting occurs.

  Note: Do not connect any cable to the RESERVED terminal.

- The four LOW-line terminals ⑧ (refer to Chapter 4.2 "Description of Rear Panel") on the rear panel of the TOS9020 may be charged to high voltage depending on the wiring setup. Deal with these terminals also very carefully (refer to Chapter 4.3 "Electrical Connections and Test Procedures").

- Before start connecting the cables to the SCAN I/F, be sure to turn off the POWER switch of the TOS9000.

— In case of Emergency —

11. Emergency handling:

In the case of any accident such as an electric shock or burn-down of the D.U.T. resulting from the failure of the tester or D.U.T., take the following actions promptly;

- Cut off the POWER switch of TOS9000, and

- Pull out the plug of AC cable of TOS9000 from the outlet of the power source.

It does not make any difference whichever action of the above two is taken first, but be sure to take the both actions.

12. Trouble of H.V ON lamp:

When the H.V ON lamp does not work, it may cause erroneous operation of the tester, which in turn give rise to dangerous electrification.

Please entrust us with the repair of such a defective tester.

♦ ♦ Attention for Trouble-Free Operation ♦ ♦

13. Do not use or store the TOS9020 in adverse environments.

The operation and storage of the unit under exposure to the direct sunshine, high temperature and humidity or dusty environment should be avoided.

4. OPERATION METHOD

4.1 Description of Front Panel

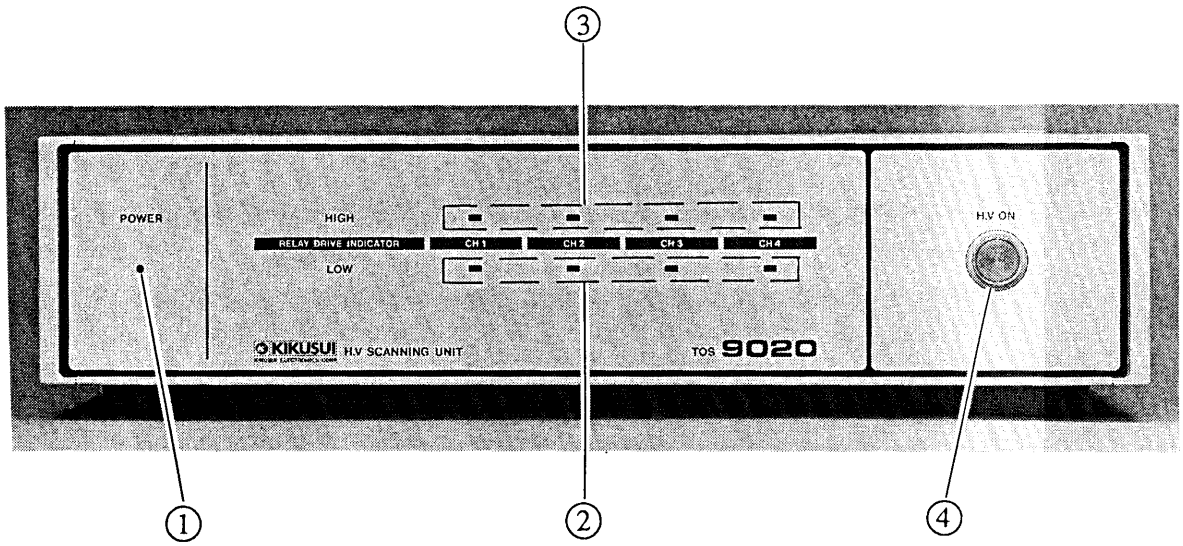


Figure 4.1

① POWER LED

This green LED lights to indicate that the POWER switch of the TOS9000 is ON, when the TOS9020 is used with the TOS9000. The TOS9020 has no power supply by itself and the power is supplied from the TOS9000. This LED is driven being linked to the power of the TOS9000.

② LOW-line relay drive (channel) indicator LEDs

One of the green LEDs lights to indicate that the test is being done (the test voltage is being delivered) through the corresponding one of the LOW-line channels as controlled by the TOS9000.

③ HIGH-line relay drive (channel) indicator LEDs

One of the red LEDs lights to indicate that the test is being done (the test voltage is being delivered) through the corresponding one of the HIGH-line channels as controlled by the TOS9000.

④ H.V ON lamp

The lamp lights during the period the TOS9000 is delivering its high output voltage (test voltage) or, when in the AUTO test, during the period from pressing of the START switch of the TOS9000 to the end of the test. The lamp is driven being linked to that on the front panel of TOS9000.

4.2 Description of Rear Panel

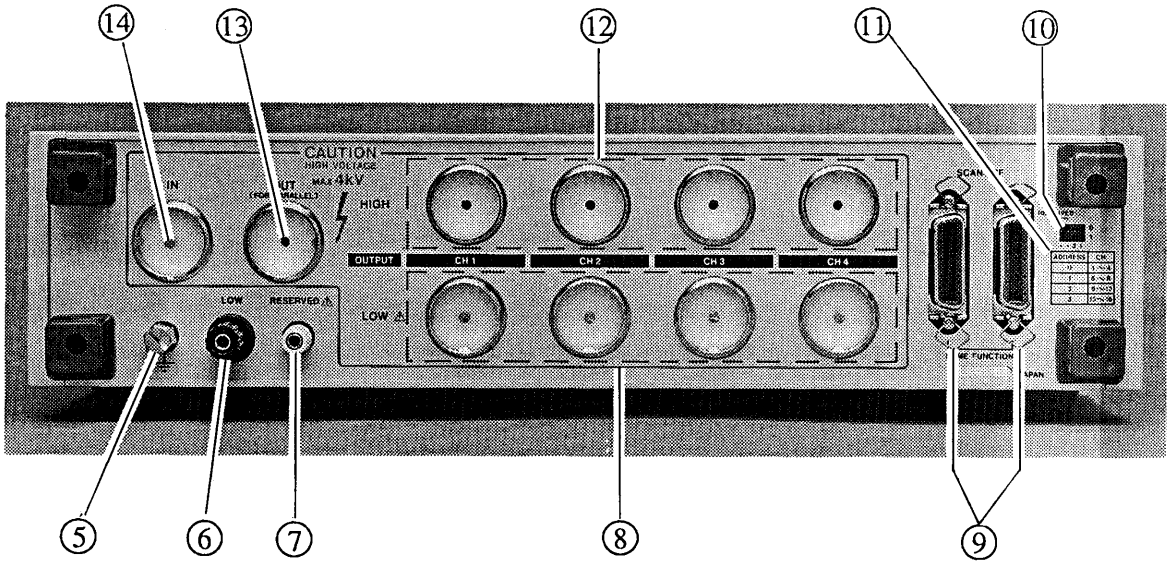


Figure 4.2

⑤ Protective GND terminal

The GND terminal is to ground the TOS9020 chassis to the earth potential. Be sure to connect securely an earth line to this terminal by using an applicable tool.

⑥ LOW terminal (black binding post terminal)

The LOW terminal is used as a lower side terminal (common terminal) of the test voltage when the TOS9020 is operated in the single-scanning mode (see Chapter 4.3.2). This terminal is constantly short-circuited at the chassis potential.

⑦ RESERVED terminal

The RESERVED terminal is for future system expansion. Do not use this terminal for regular tests. Do not connect any devices or other objects to this terminal.

Caution!

Exercise care so that no cables are brought into contact with the RESERVED terminal. Especially, never let the HIGH-line side be shorted to the RESERVED terminal because the shorting may cause serious results.

⑧ LOW-line terminals for output channels

These are the lower side test voltage terminals for respective output channels (1 through 4). Only one of them, which has been selected by the TOS9000, is connected to the lower line of the output voltage (test voltage). Three other terminals are not connected to any lines and remain electrically open.

When it is operated in the multi-scanning mode or when the TOS9000 is use the contact check function, the contact check voltage and high voltage are applied at these terminals. Because both HIGH-line and LOW-line terminals of the same channel number are connected with a same test point.

Precaution!

Note that, although these four terminals are identified as "LOW-line" terminals, the high test voltage is applied to these terminals in the above-mentioned cases. Exercise care also when dealing with these terminals. Securely connect the connectors of these terminals, observing the instructions given in Chapters 4.3.1 and 4.3.2.

⑨ SCAN I/F Connectors

There are two I/F connectors—one is for interfacing of control signals between the TOS9020 and the TOS9000, and the other is for that between this TOS9020 and another TOS9020 which operates in parallel.

The chassis potential of the TOS9020 is made identical with that of the TOS9000 as their chassis are electrically connected via the I/F connector.

Note: Be sure to lock the I/F connectors to guard it against accidental disconnection when in operation.

For electrical wiring, be sure to use the cables which are supplied as standard or optional accessories of the TOS9020.

⑩ Address setting switches

These switches are used to set the unit number (device address number).

For the setting procedure, refer to Chapter 4.4 "Unit Number Setting."

⑪ Table of unit address numbers and channel numbers

The table shows the relationships between unit numbers (device address numbers) and channel numbers. Refer to Chapter 4.4 "Unit Number Setting."

⑫ HIGH-line terminals for output channels

These are the high test voltage terminals for respective output channels (channels 1 through 4). Only one of them, which has been selected by the TOS9000, is connected to the high voltage line of the output voltage (test voltage).

When the TOS9000 executes the contact check function, the check voltage may be temporarily applied also from the HIGH-line output terminal of the channel which has been set for the lower test voltage side.

Precaution!

Make it double sure that the cables are correctly connected to these terminals and that the connectors are securely mated, by observing the instructions given in Chapters 4.3.1 and 4.3.2.

⑬ OUT (FOR PARALLEL) terminal

The OUT terminal is to deliver the high test voltage (which is received from the TOS9000 via the IN terminal ⑭) to the IN ⑭ terminal of another TOS9020 in parallel operation.

Precaution!

This terminal delivers the high output voltage when in test.

Securely connect the cable to this terminal by observing the instructions given in Chapters 4.3.1 and 4.3.2.

Do not connect this terminal directly to the D.U.T.

⑭ IN terminal

This instrument receives the test voltage (high voltage side) from the TOS9000 and delivers it through the HIGH output terminal which has been set for the high voltage side. This terminal is for OUT (FOR PARALLEL) terminal of another TOS9020 in parallel or to the TOS9000. During the test, the test voltage is supplied constantly.

Precaution!

This terminal handles the high output voltage when in test. Securely connect the cable to this terminal by observing the instructions given in Chapters 4.3.1 and 4.3.2.

Do not connect this terminal directly to the D.U.T.

4.3 Operation Outline of This Instrument and Electrical Connection

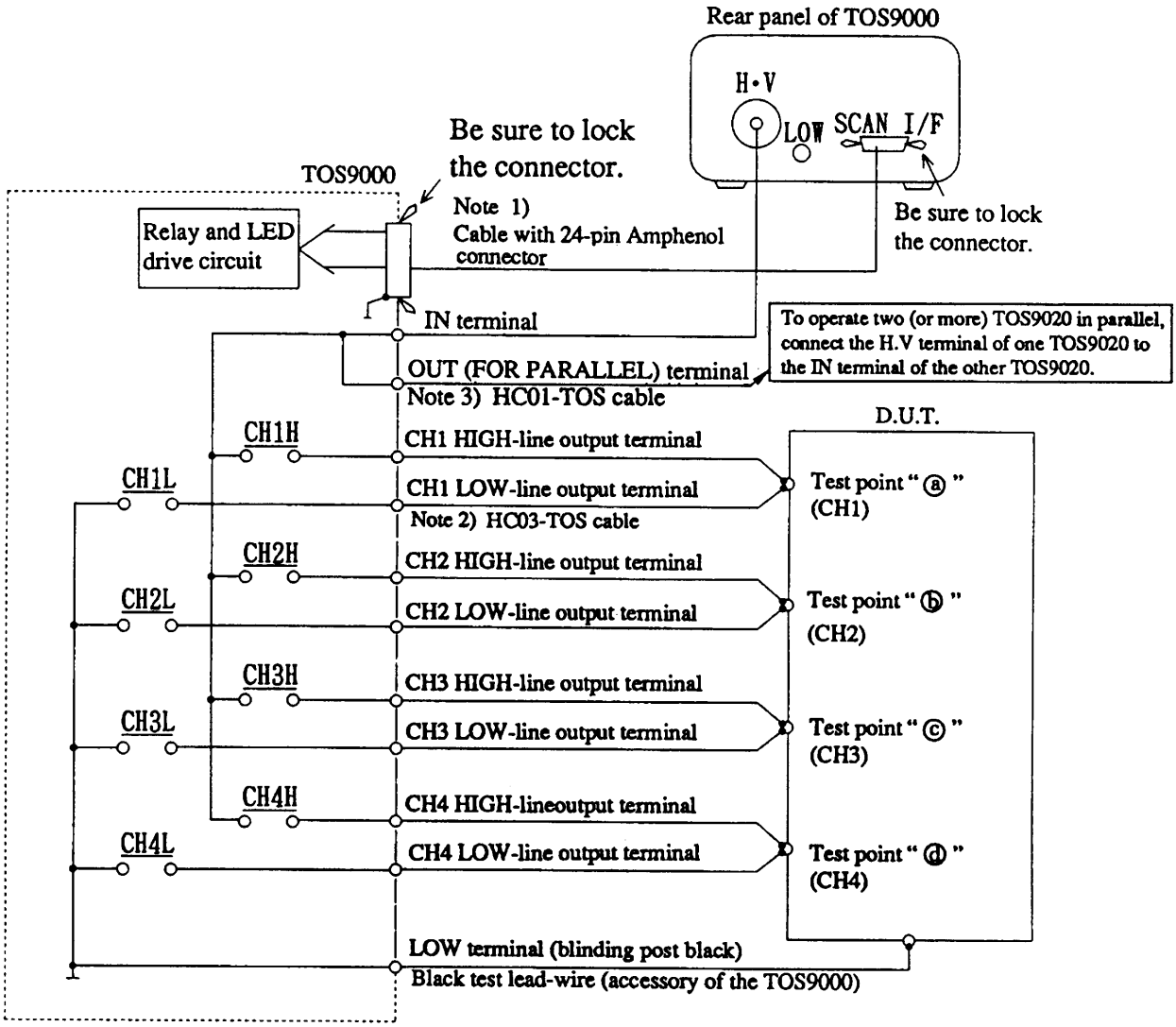


Figure 4.3

Note 1: The low-side electrical connections between TOS9000 and TOS9020 are accomplished via the 24-pin Amphenol connector (the TOS9000 LOW terminal is connected to the TOS9020 LOW terminal or to the TOS9020 LOW-side output terminal of the channel which is designated to be the low voltage side.) Be sure to lock the connector after connecting it.

Note 2: Model HC03-TOS high voltage cables which connect the output channels of TOS9020 to the D.U.T. are supplied in pairs—each pair consisting of a HIGH-side cable and a LOW-side cable.

Note 3: Model HC01-TOS shielded high voltage cable (accessory of TOS9020) is for connection between two units of TOS9020 operated in parallel.

Note 4: The black test lead-wire which is supplied as an accessory of the TOS9000 must be used only when the TOS9020 is operated in the single-scanning mode. Be sure to use the black test lead-wire when operating the TOS9020 in this mode.

4.3.1 Electrical Connections of This Instrument, TOS9000, and D.U.T.

Precaution!

Before start connecting the cables for the test setup, be sure that the POWER switch of TOS9000 is OFF.

(1) When you operate the TOS9020 in the single-scanning mode described in Chapter 4.3.2, connect the LOW terminal ⑥ (black binding post terminal) on the rear panel to the D.U.T. with the black test lead-wire which is an accessory of the TOS9000.

(2) Connect the SCAN I/F ⑨ connector on the rear panel to that of TOS9000 with the signal cable which has 24-pin Amphenol connectors (accessory of TOS9020). Be sure to lock the connectors after connecting them.

(3) Connect the HIGH-line output terminals ⑫ and LOW-line output terminals ⑧ on the rear panel to respective test points with HC03-TOS cables as shown in Figure 4.3.

When doing this, be sure that the HIGH-line and LOW-line output terminals of the same channel is connected to the same test point.

(4) Connect the IN terminal ⑭ on the rear panel to the H.V terminal on the rear panel of TOS9000 with the shielded high voltage cable (red, approx. 11mm dia.) which is an accessory of the TOS9020.

4.3.2 Operation Outline of This Instrument

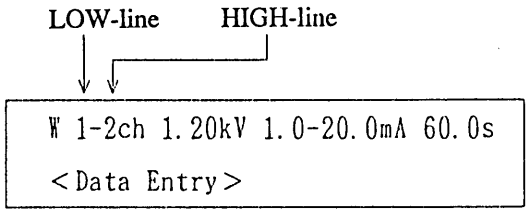
A. Multi-scanning Mode

In the multi-scanning mode of test operation, any two of the four test points (" ⓐ " through "ⓓ" of the D.U.T. as shown in Figure 4.3) can be selected and the selected two points can be designated to be a HIGH-line and a LOW-line (either one for the HIGH-line and the other for the LOW-line) by the TOS9000.

Example 1:

Assume that, referring to Figure 4.3, you execute a test between test point "ⓐ" and "ⓑ" (between channels "1" and "2") by designating the former for the LOW-line and the latter for the HIGH-line.

An example of setting with the TOS9000 for this test is shown below.

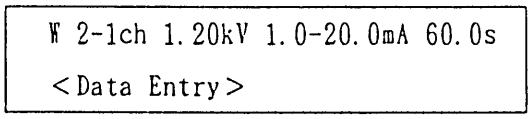


As a test starts with these test parameters, only two (CH1L and CH2H in Figure 4.3) of the internal relays of TOS9020 are energized. Thereby, the lower side voltage (potential of the lower line) is connected to the test point "ⓐ" via the CH1 LOW-line output terminal and, the high voltage (potential of the H.V line) is connected to the test point "ⓑ" via the CH2 HIGH-line output terminal. Of the relay drive indicators on the front panel, the green LED lights for CH1 and the red LED lights for CH2 to indicate the actions of the internal relays of TOS9020.

Example 2:

Assume that you execute a test with the test parameters identical with those of Example 1, except that test point "ⓐ" is to be designated the HIGH-line and test point "ⓑ" to be the LOW-line in the reverse of the case of Example 1.

An example of setting for this test is shown below.



As a test starts with these test parameters, the two (CH1H and CH2L in Figure 4.3) of the internal relays of TOS9020 are energized. Thereby, the high voltage side (potential of the H.V line) is connected to the test point "ⓐ" via the CH1 HIGH-line output terminal and, the lower side voltage (potential of the lower line) is connected to the test point "ⓑ" via the CH2 LOW-line output terminal. Of the relay drive indicators on the front panel, the red LED lights for CH1 and the green LED lights for CH2 to indicate the actions of the internal relays of TOS9020.

As seen in Examples 1 and 2, the LOW-line and HIGH-line of the test voltage for a test point can be easily changed by changing the setting of the TOS9000. While the examples are for the W test (withstanding voltage test), the same principle is also applicable to the I test (insulation resistance test). For actual key operation of the TOS9000, refer to the instruction manual for the TOS9000.

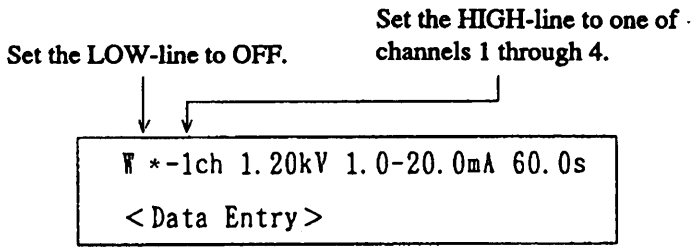
B. Single-scanning Mode

The single-scanning mode of test operation is such that, by connecting one of the test point to the LOW terminal ⑥ (black binding post terminal) on the rear panel of TOS9020 and using this line fixedly for the lower line side, the high voltage side (the potential of the H.V line) can be scanned for all test points of the D.U.T. connected to the test channels of TOS9020.

Example 3:

Assume that, referring to Figure 4.3, you execute a test between test point "ⓐ" (channel 1) of the D.U.T. and test point "ⓔ" which is connected to the LOW terminal ⑥ (black binding point terminal) on the rear panel.

An example of setting with the TOS9000 for this test is shown below.



As a test starts with these test parameters, only one (CH1H in Figure 4.3) of the internal relays of TOS9020 is energized. Thereby, the high voltage side (potential of the H.V line) is connected to the test point "ⓐ" via the CH1 HIGH-line output terminal. Of the relay drive indicators on the front panel, the red LED lights to indicate the internal relay action of TOS9020.

Example 4:

Assume that you execute a similar test as that of Example 3, with only difference that test point "ⓒ" (channel 3) is to be used instead of test point "ⓐ" (channel 1).

An example of setting with the TOS9000 for this test is shown below.

```
W *-3ch 1.20kV 1.0-20.0mA 60.0s
<Data Entry>
```

As can be seen in Examples 3 and 4, by fixing the lower side to the test point "ⓔ" which is connected to the LOW terminal ⑥ (black binding post terminal) on the rear panel and using this line fixedly for the lower side, the high voltage can be scanned to any one of the test points ("ⓐ" through "ⓓ"). While the examples are for the W test (withstanding voltage test), the same principle is also applicable to the I test (insulation resistance test). For actual key operation of the TOS9000, refer to the instruction manual for the TOS9000.

As can be seen in Examples 1 through 4, the test setup can be used either in the multi-scanning mode or in the single-scanning mode by slightly changing the cable connections and test programs.

DANGER!!

Be sure to securely connect the shielded high voltage cables—the cables of the OUT and IN terminals (⑬ and ⑭) and those of the LOW-line and HIGH-line output terminals (⑧ and ⑫) on the rear panel of TOS9020. If the connectors of these cables are loose, the shielding wires of the cables may be charged up to a high voltage leading to a very dangerous state. Make it double sure that the cable connectors are tightly mated.

C. Contact Check Function

This function checks whether an electrical continuity of the test circuit has been attained or not. For example, the function is used to verify that a test probe or a test jig has been contacted to a test point of the D.U.T. This function also checks for open-circuiting of the cable and for contact failure of connectors. This function is executed immediately before starting the test in the Single Test mode or AUTO mode.

If you set this function, set the CONTACT CHECK parameter "ON" when in the INITIAL SETTING procecure with the TOS9000. If it is not necessary, set the parameter to "OFF." For details, refer to the instruction manual of the TOS9000.

The contact check operation is as follows:

As the START switch of the TOS9000 is pressed, the electrical continuity between the HIGH-line and LOW-line output terminals of the channel designated to be the lower voltage side is checked at first. Next, that of the high voltage side is checked. If an electrical continuity is verified for both of them, the TOS9000 makes a PASS decision; if no electrical continuity due to open-circuiting, contact failure or other cause is verified, it makes a FAIL decision.

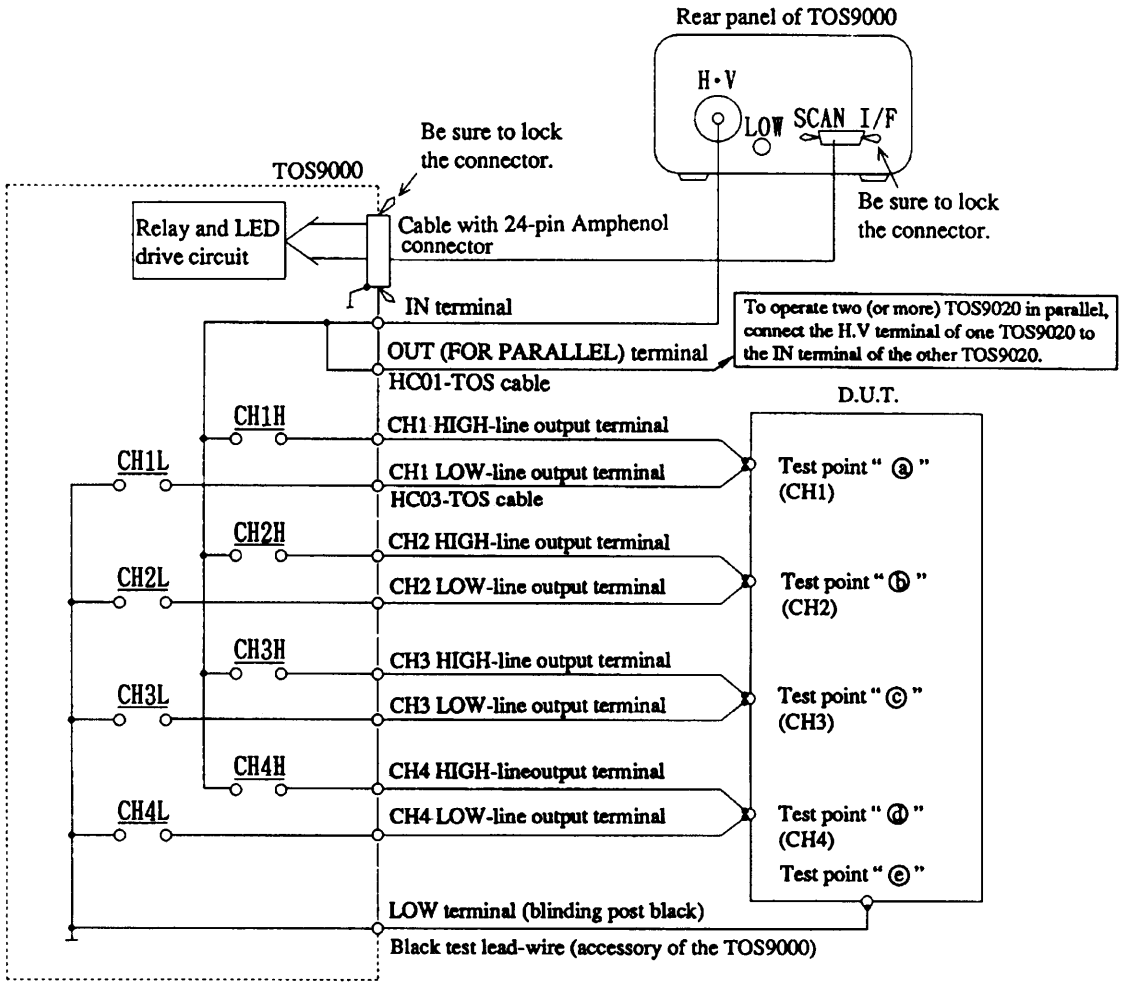


Figure 4.4

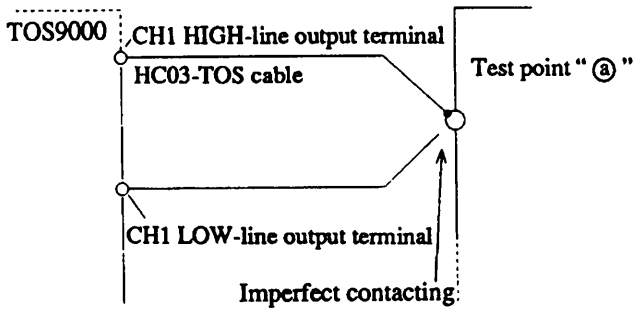


Figure 4.5

Example 5:

Assume that, referring to Figure 4.4, you execute a test between test point " ⓐ " (channel "1") and test point " ⓑ " (channel "2") by designating the former for the high voltage side and the latter for the lower side.

As the check operation starts, at first the two relays (CH2H and CH2L) of the channel (channel "2" in this example) which has been designated for the lower side are energized simultaneously. When both HIGH-line and LOW-line terminals of channel "2" are correctly connected to the test point " ⓑ ", it is short-circuiting between high voltage line side and lower line side. Therefore a short-current flows. By detecting the short-current, the TOS9000 makes a PASS decision that there is an electrical continuity among the channel designed as LOW-line side and the D.U.T. Thereupon, both relays (CH2H and CH2L) are de-energized.

Next, a similar check is done for the channel (channel "1" in this example) which has been designated for the high voltage side.

When the result of contact check is a PASS, no indications (neither with lamps nor messages) are made .

If there is an imperfect contacting between the TOS9020 and the D.U.T. as shown in Figure 4.5, no short-current will flow between HIGH-side and LOW-side, and the TOS9000 will take it for that there is a contact failure. A message as shown below will appear on the display screen, the alarm lamp will light and the buzzer will sound, and a CONTACT FAIL signal and a FAIL signal (open collector signal) will be generated.

<<<Contact Fail>>>

During the contact check operation, of the relay drive indicators, both HIGH and LOW LEDs of the corresponding channel light at the same time to indicate the actions of the internal relays of TOS9020.

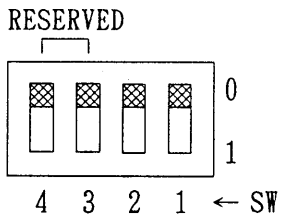
Note: When the TOS9020 is in the Single-scanning mode (see Page 4-8), contacting between the low voltage side (LOW terminal ⑥ in Figure 4.4) and the test point " ⓒ " cannot be checked.

When the TOS9020 is in the Single-scanning mode, if contacting is not required to be checked, the LOW-side output terminals are not required to be connected to the D.U.T.

4.4 Unit Number Setting

When operating two to four units of TOS9020 in parallel, unit numbers (address numbers) must be assigned to them. The channel numbers of the test setup depend on the unit numbers.

The unit number can be set with the address setting switches ⑩ (DIP type) on the rear panel as shown below.

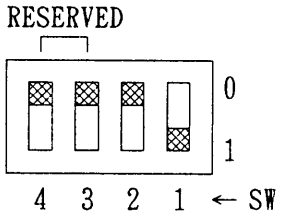


For unit number 0

Set both SW1 and SW2 to 0.

The channel numbers of this unit are CH1 through CH4.

Figure 4.6

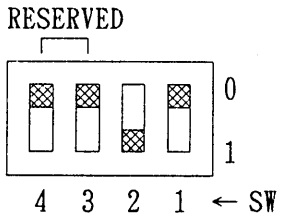


For unit number 1

Set SW1 to 1 and SW2 to 0.

The channel numbers of this unit are CH5 through CH8.

Figure 4.7

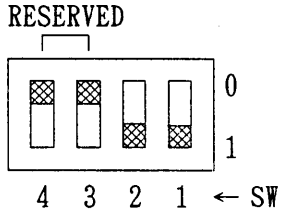


For unit number 2

Set both SW1 to 0 and SW2 to 1.

The channel numbers of this unit are CH9 through CH12.

Figure 4.8



For unit number 3

Set both SW1 and SW2 to 1.

The channel numbers of this unit are CH13 through CH16.

Figure 4.9

For units 1 through 3, post the stickers of the corresponding numbers in the center of the front panel and in the center of the rear panel at above the "CH1, CH2..." marking. Stickers are accessories of TOS9020.

4.5 General Precautions Before Starting Test

(1)

> *Before starting test either in the multi-scanning or single-scanning mode, make it double sure that electrical connections for the test setup have been correctly done.*
>
> *Be sure that the connectors of the high voltage cables on the rear panel of TOS9020 are tightly mated. If they are loose, the shielding wires of the cables can be charged up to a high voltage leading to a very dangerous state. Check once more that the metallic shells of the cable connectors are tightly mated with the receptacles.*

(2)

> *While the maximum rated output voltage of the TOS9000 is 5kV, the maximum voltage which can be handled by the TOS9020 is 4kV due to the dielectric strengths of the cables and connectors.*
>
> *Exercise care so that the TOS9000 does not deliver voltages higher than 4kV to the TOS9020.*

(3)

> *Be extremely careful so that the high test voltage line is not shorted to the RESERVED terminal or to the shielding wire of a shielded high voltage cable. Note that serious damage and hazards may result if such shorting occurs.*

(4) If one or more of the below-mentioned states arise when the test is being executed, the protective function of the TOS9000 will be brought into effect and the test will not be able to be executed.

(a) The 24P Amphenol connector is disconnected.

(b) When setting of the unit number is changed with the address switches.

(c) When there is no TOS9020 which has the channel number specified by the TOS9000.

(d) When there are two or more units of TOS9020 whose unit numbers are set at the same number with their address switches.

When one or more of the above states have occurred, the following message will appear on the display screen of TOS9000.

!!!Scan unit line confused!!! Check machine condition

When this state has occurred, check once more the setting of the address switches and connections of the 24P Amphenol connectors.

After making sure that they are correct and secure, press the STOP switch of TOS9000. After the display screen of TOS9000 is changed to the test condition display, check once more the channel programming on the TOS9000 and the setting of the TOS9020 and then re-start the test.

4.6 Starting the Test

After confirming that the test cables are correctly connected and the safety of the test setup is securely attained, press the START switch of TOS9000 or apply a start signal. The test will start with the test setting on the TOS9000. (For the actual test start procedure, refer to the instruction manual for the TOS9000.)

Note: When the contact check function is made use of, the period from the instant the START switch is pressed (or a start signal is applied) to the instant the actual test starts is 0.5 seconds or less in the multi-scanning mode (for contact check for both HIGH and LOW channels), and it is 0.25 seconds or less in the single-scanning mode (for contact check of the HIGH channel alone).

Therefore, when single tests (tests of withstanding voltage or of insulation resistance) are to be consecutively done, a period of "[actual test time] + [data processing time (time required for processing of PASS signals and other data by the TOS9000)] + [contact check time]" must be provided between the beginning of one test and that of next test.

A period still longer must be provided when the output time requirement of withstanding voltage test or when the discharge time requirement of insulation resistance test is to be taken into account. For details, refer to the instruction manual for the TOS9000.

5. MAINTENANCE

The TOS9020 deals with a hazardously high voltage of 4kV AC. Never attempt to repair the unit for yourself. For such service, contact KIKUSUI agent.

6. OPTIONAL ITEMS

Optional rack mount brackets for the TOS9020 are available as follows:

- BH2M-KSG Rack Mount Brackets

  The BH2M-KSG are for mounting the TOS9020 on a rack. These brackets conform with JIS (Japanese Industrial Standard).

H.V Scanning Unit **TOS9020** **INSTRUCTION MANUAL**