

OPERATION MANUAL

W/I CONTROLLER

MODEL 916

First Edition

**WARNINGS** against **HIGH VOLTAGE**

- o Model 916 generates high voltage, combined with Model 871 and Model 874.*
- o Any incorrect handling may cause death.*
- o Read Section 3 "WARNINGS" in this manual to prevent accident.*
- o This manual should be placed within the reach of the operator so that he may read it whenever necessary.*

KIKUSUI ELECTRONICS CORPORATION

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— 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 tester for easy access of the operator.*

== ATTENTION ==

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

*Read Section 3 "WARNINGS" in Operation Manual of Model 871 and Model 874.*

— 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 an acceptance inspection to see if the tester has any in-transit damage. Should there be any, please inform our local dealer of such a damage.

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## 1 . GENERAL

Model 916 W/I (withstanding-voltage/insulation-resistance) Controller has been designed to control Model 871 W/I Tester, with or without Model 874 Output Voltage Remote Controller. The 916 allows to preset up to four test states. For each of the test states, either the withstanding voltage test mode or the insulation resistance test mode can be selected.

When the withstanding voltage test mode is selected, the 916 W/I Controller can specify up to four channels of Model 874 Output Voltage Remote Controller in which test voltages have been preset as required.

When the insulation resistance test mode is selected, the 916 W/I Controller can dictate the 871 W/I Tester to select either 1000 V or 500 V for the test voltage.

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## 2. SPECIFICATIONS

Number of Test States

4 states per one unit of 916 W/I Controller.

(Tests can be terminated at any one of the four states.)

Up to 8 states by operating two controllers in a master-slave mode.

Controllable Items

① To select the W test or I test, and to command test execution.  
(By directly dictating the 871 Tester)

② To select test voltages for W-test. (By selecting the required one or ones of the four channels of the 874 Output Voltage Remote Controller in which test voltages have been preset)

③ To select 1000 V or 500 V for test voltage for insulation resistance test. (By dictating the 871 Tester)

Interval Time Between States

1 sec  $\pm 20\%$

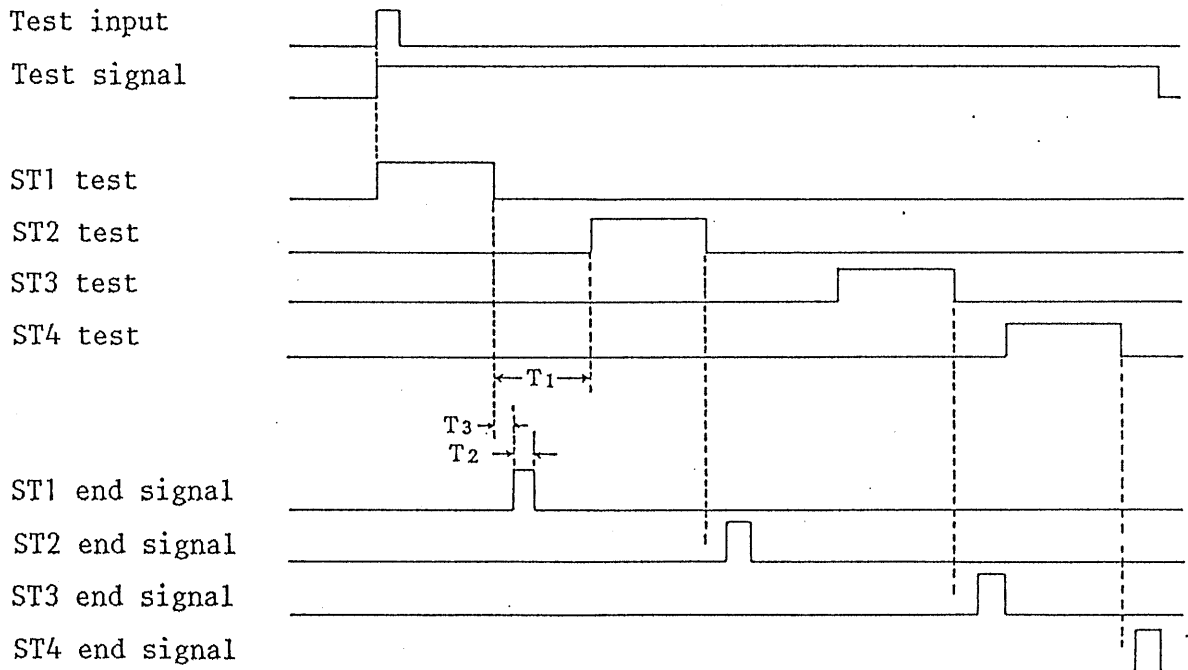
End Signal Output

Delivers an end signal for each test state.

Type of signal: Make-contact signal  
(ratings 100 VAC 1 A, or 30 VDC, 1 A).

Signal duration: 100 msec  $\pm 20\%$

Timing Chart



- o ST: Stands for "state"
- o T1: 1 sec  $\pm 20\%$  (Time interval between states)
- o T2: 100 msec  $\pm 20\%$  (Duration of end signal)
- o T3: 200 msec  $\pm 20\%$  (Period from termination of test signal to generation of end signal)

Overall Dimensions

Plane to plane: 250 mm wide, 60 mm high, 110 mm deep  
 Including protrusions: 260 mm wide, 90 mm high, 115 mm deep

Weight

Approx. 1.2 kg

Accessories

5P DIN cables	2	5P DIN connector	1
8P DIN cables	2	8P DIN connector	1
Operation manual	1		

- Remarks: The test system consisting only of the 871 W/I Tester and the 916 W/I Controller cannot be incorporated with the SPEC 81811 Test Adaptor or the Low Resistance Tester.

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### 3. WARNINGS

*Model 916 supplies high voltage up to 5kV to the outside connection, combined with Model 871 and Model 874.*

*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.*

*(In this section, "Tester" means the 871 Withstanding Voltage/Insulation Resistance Test System, including Model 874 and Model 916.)*

(1) Electrification

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

(2) Before connecting the 916 W/I Controller to the 871 W/I Tester or the 874 Output Voltage Remote Controller, be sure that the power switches of the units are turned off. The same applied also when connecting the master unit to the slave unit when two 916 Controllers are operated in a master-slave mode. Exercise care so that the W/I Tester is not driven into the TEST ON state when connecting the units.

(3) Keep it in mind that, as you press the TEST switch of the 916 W/I Controller, the 871 W/I Tester delivers a high test voltage which can cause electric shock hazards. Never inadvertently press the TEST button of the 916 W/I Controller. Keep this in mind especially when the 916 is located far apart from the 871.

(4) Operation of the TEST/RESET switch of the 916 W/I Controller can be remote-controlled with an external signal. When operating the system with this provision, be still more careful not to drive inadvertently the 871 W/I Tester into the TEST ON state.

(5) If the TEST ON lamp of the 916 W/I Controller does not illuminate in spite of the fact that the 871 W/I Tester is in the TEST ON state, this means that the 916 has failed. Immediately stop using the 916 and order your Kikusui agent for repair.

(6) Do not use or store the 916 W/I Controller in direct sunlight, high temperature, high humidity, or dusty atmosphere.

## 4. OPERATION INSTRUCTIONS

### 4.1 Front Panel Description

① TEST ON Lamp

The lamp illuminates red to indicate that the system is executing the test.

② OPERATE ON/OFF Switch

The test is enabled only when the switch is set to ON.

So far as the switch is kept in the OFF state, the system is unconditionally kept in the reset state and the test is disabled and no test voltage is delivered even if the TEST button is pressed. So far as there is no imminent test to be executed, keep the switch in the OFF state.

③ TEST Button

The system starts executing the test as you press this button, provided that the OPERATE ON/OFF switch is set to ON and the system is in the reset state.

④ RESET (OUTPUT OFF) Button

As you press the button, the test being executed is halted and the system is reset. The button can be used also to reset the 871 W/I Tester or the 874 Output Voltage Remote Controller from the NG state or the PROTECTED state (provided that the cause of trip of the protective circuit has been eliminated).

### 4.2 Rear Panel Description

⑤ TEST/RESET REMOTE CONTROL Connector

The connector accepts an external control signal with which to remote-control the test/reset switching function of the 916 W/I Controller.

⑥ TO VOLTAGE REMOTE CONTROLLER (CHANNEL SELECT) Connector

The connector delivers a signal with which to select the required one or ones of the channels of the 874 Output Voltage Remote Controller in which test voltages are preset.

⑦ TO W/I TESTER (I TEST) Connector

The connector delivers for the 871 W/I Tester a signal with which to select either 1000 V or 500 V for insulation resistance test.



⑧ TO W/I TESTER (FUNCTION) Connector

The connector is for the basic connection between the 916 W/I Controller and the 871 W/I Tester.

⑨ ⑩ FOR CASCADE A/B Connector

The connector is for connection between two 916 W/I controllers for cascade mode (master-slave mode) of operation to increase the number of available test states.

⑪ SIGNAL OUT Connector

The connector delivers a TEST ON signal indicating that the system is executing a test, and a STATE END signal indicating the end of a test state.

#### 4.3 Test Methods and Procedures

To Specify the Contents of Test

(1) The conditions of test which can be preset with the 916 W/I Controller are as follows:

- ① To select W-test (withstanding voltage test) or I test (insulation resistance test) for each of states 1 - 4.
- ② When W-test is selected by ①: To specify one of the channels (CHO - CH3) of the 874 Output Voltage Remote Controller in which test voltages are preset.
- ③ When I-test is selected by ①: To select 1000 V or 500 V for the insulation resistance test voltage.
- ④ To specify the final test state.

(2) The conditions of test can be preset in the following procedure:

- ① Remove the casing of the 916 W/I Tester by removing two side screws and four bottom screws. Five DIP switches and one slide switch are installed on the internal PC board as shown in Figure 4.1. Set the conditions of test with these switches.

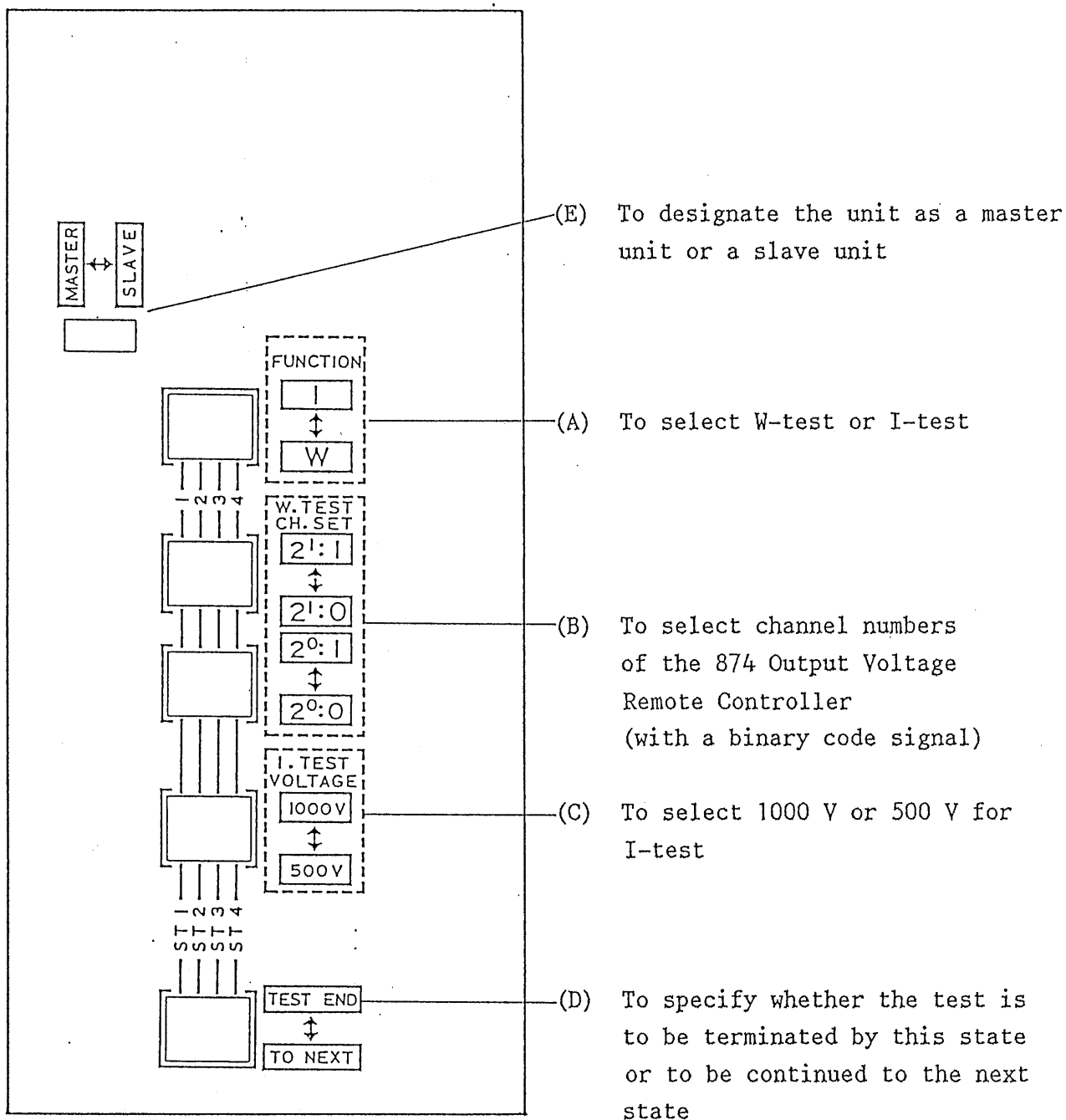


Figure 4.1 Layout of Switches on PC Board

② The switches of the column marked "ST1" or "1" are for specifying the conditions of test state 1.

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- ③ To select the W-test for state 1, set the FUNCTION switch ((A) in Figure 4.1) to W; to select the I-test, set it to I.
- ④ When the W-test is selected for state 1, specify a channel or channels (up to four channels) of the 874 Output Voltage Remote Controller in which test voltages have been preset. (Channel numbers 1 - 3 can be selected in any order. For simplicity, it is best to select them in the order of 1-2-3.)

Set the 1st test voltage with the digital switches of channel 1 (hereafter, channel is abbreviated as CH) of the 874 Output Voltage Remote Controller; set the 2nd test voltage with those of CH2 and the 3rd test voltage with those of CH3.

The 4th test voltage can be set for CH0. However, since CH0 is for remote control, no digital switches for this channel are provided in the 874 Output Voltage Remote Controller. (For remote control of the test voltage of CH0, refer to the operation manual of the 874 Output Voltage Remote Controller.)

- ⑤ When the W-test is to be repeated, if the test voltage is the same, it is not necessary to repeat setting of the test voltage in the 874. If the required test voltage has been preset in one of the channels of the 874, the voltage can be called out simply by specifying the channel number.
- ⑥ The voltage preset in the 874 can be called out by specifying the channel number with the W-TEST CH SET switches ((B) in Figure 4.1). The channel number can be specified with a binary code signal as shown in the following table.

CH No.	Switch setting		Binary code
	2 <sup>1</sup> column	2 <sup>0</sup> column	
CH "0"	2 <sup>1</sup> → 0	2 <sup>0</sup> → 0	00
CH "1"	2 <sup>1</sup> → 0	2 <sup>0</sup> → 1	01
CH "2"	2 <sup>1</sup> → 1	2 <sup>0</sup> → 0	10
CH "3"	2 <sup>1</sup> → 1	2 <sup>0</sup> → 1	11

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- ⑦ When the W-test is selected for test state 1, selection of the insulation resistance test voltage mentioned in ⑧ may be left undone (it may be left either at 1000 V or 500 V).

Although the currently selected voltage is specified for the test, no insulation resistance test is executed and the withstanding voltage test alone is executed.

- ⑧ When the I-test is selected for test state 1, select 1000 V or 500 V for the insulation resistance test voltage with the I-TEST VOLTAGE switch ((C) in Figure 4.1).

Note: Note the following if your 871 W/I Tester has been modified for other insulation resistance test voltages than 1000 V and 500 V. The nominal 1000 V represents the higher one of the modified test voltages and the nominal 500 V the lower one. Assuming that the 871 has been modified for I-test voltages 500 V and 250 V for example, the 871 will deliver actual 500 V when nominal 1000 V is specified or actual 250 V when nominal 500 V is specified.

- ⑨ When the I-test is selected for test state 1, specifying of channels of the 874 for W-test output voltages mentioned in ⑥ may be left undone. Although the currently selected channel is specified for the test, no withstanding voltage test is executed and the insulation resistance test alone is executed.

- ⑩ The TEST END/TO NEXT switch ((D) in Figure 4.1) is to specify the end of a series of test states. For example, if the switch is set to TO NEXT when in test state 1, the test advances to test state 2; if it is set to TEST END, the test terminates by test state 1.

- ⑪ The above procedure is for test state 1. Perform identical procedure for the subsequent test states also.

- ⑫ When the test is required to be preset up to test state 4, be sure to set the TEST END/TO NEXT switch of test state 4 to TEST END. Note that the system will not perform correctly unless the switch is set to TEST END.

- ⑬ When the system has only one unit of the 916 W/I Controller, set the MASTER/SLAVE switch to MASTER.

Test Time

- (1) The period during which the W-test voltage or I-test voltage is applied can be preset with respective timers of the 871 W/I Tester.
- (2) It is not available to set different test periods for different test cycles of W-test or I-test.
- (3) When the 871 W/I Tester is controlled by the 916 W/I Controller, the TIMER ON/OFF switch of the 871 is disabled. Irrespective of whether the switch is set to ON or OFF, the test period is as preset by the timer.

When the test voltage preset for each test state is required to be monitored, set the timers of W-test and I-test at appropriate periods.

- (4) If the 871 W/I Tester has a standard timer (999 sec), the minimum available test period per one test state is 1 second.

If the 871 has a semi-standard timer (99.9 sec), the timer itself allows the minimum test period of 0.1 sec. When the 871 is controlled with the 916, however, be sure to set the period not shorter than 0.5 seconds. Note that the operation sequence of the 916 may be disturbed and the test may become unsuccessful if the preset test period is shorter than 0.5 seconds.

Connections of System Components

A connection diagram of the componential units of the system is shown in Figure 4.2. A system setup with two 916 W/I Testers for cascade (master-slave) mode of operation is shown in Figure 4.3.

Figure 4.2 Connections of System Components

Note: The layout and nomenclature of the switches and connectors of the actual system components may differ from those shown in these illustrations which are for reference only.

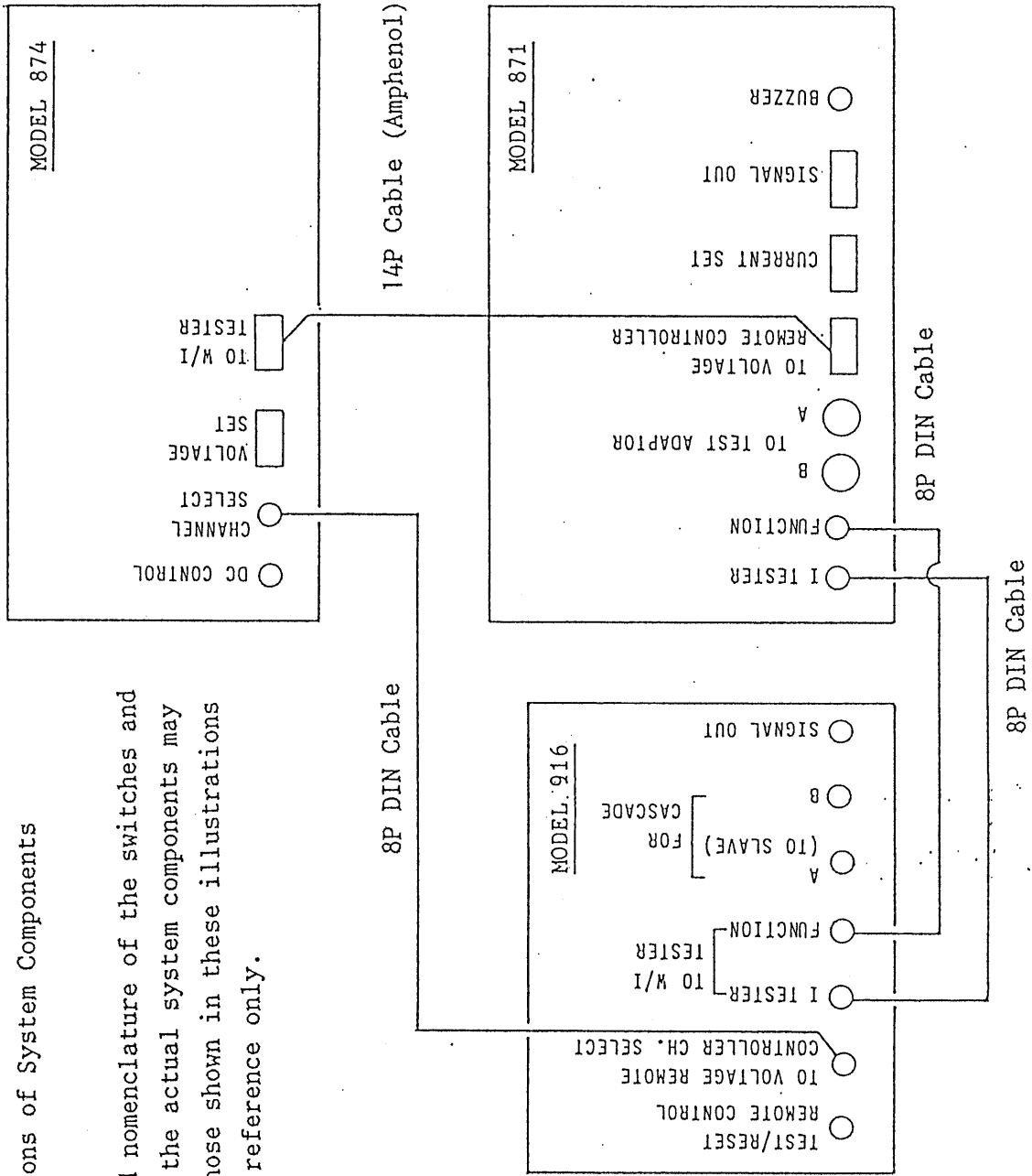
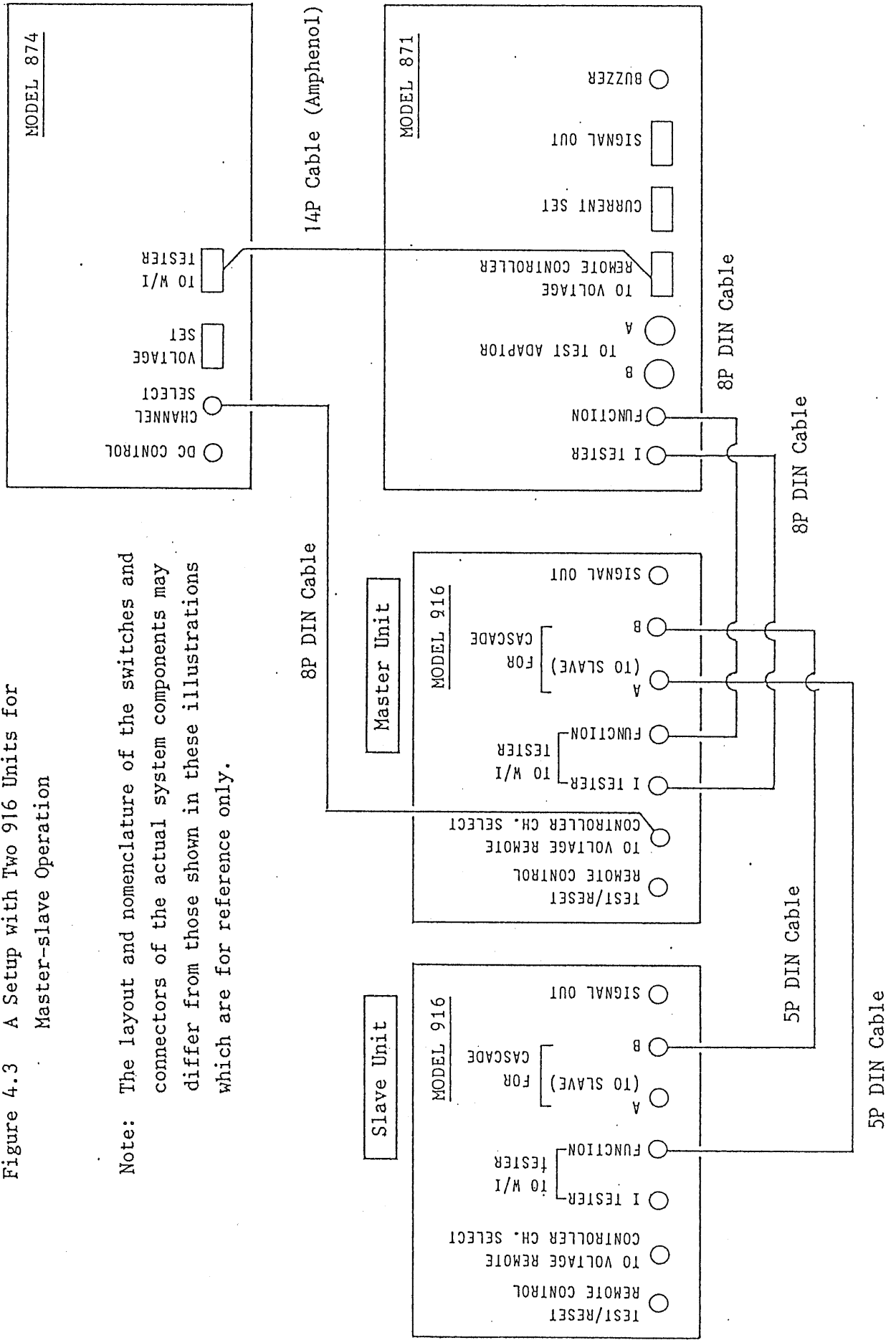


Figure 4.3 A Setup with Two 916 Units for Master-slave Operation

Note: The layout and nomenclature of the switches and connectors of the actual system components may differ from those shown in these illustrations which are for reference only.



Test Operation

(1) For a period of approximately 2 seconds after the power switch of the 871 W/I Tester is turned on, the system cannot be driven into the TEST ON state as the initial reset circuit of the 916 W/I Controller inhibits it during the period.

(2) To start the test, set the OPERATE ON/OFF switch of the 916 to ON and press the TEST button.

Note: If the 871 or the 874 is generating a PROTECT signal, the system is in the PROTECTED state and does not start the test. Eliminate the cause of the PROTECT signal and then reset the system from the PROTECTED state. For the causes of the PROTECT signals, refer to the respective operation manuals of the 871 and the 874.

(3) To halt the test which is being executed, press the RESET button of either 916 or 871.

(4) When the 871 has generated an NG signal as a result of GO-NOGO judgement, the system terminates the test and provides NG alarm signals for the operator and the related equipment.

To resume the test, remove the tested object and reset the system.

(5) The TEST/RESET switching function of the 916 can be remote-controlled with an external signal. The control system is of a low-active type. The control signal can be fed via the TEST/RESET REMOTE CONTROL connector. The pin assignment of the connector is as shown in Table 4.1 and the pin layout is as shown in Figure 4.4. The control method is identical with that of the 871. Refer to the operation manual of the 871 W/I Tester.

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Table 4.1 Connector Pin Assignment

Pin No.	Name of Signal	Input/Output	Remarks
1	TEST ON SIGNAL	Output	Denotes the TEST ON state. Approx. +24 V. Delivered via 1.5 kΩ resistor
2	COM		
3	TEST/RESET R/L	Input	To specify remote or local. Must be "L" for remote control.
4	TEST	Input	An event of driving these signal to "L" is identical in effect with an event of pressing the TEST/RESET button on the panel.
5	RESET		

Remarks: The signals become "L" as they are shorted to the COM line.

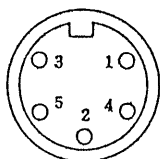


Figure 4.4  
Connector Pin Layout  
(As viewed from chassis rear)

Remarks: The connector is a 5-pin connector of a DIN type. Note that the pin layout is not in the regular order of numbering.

Cascade Operation (Master-slave Operation)

(1) Up to four test states can be handled by one unit of 916 W/I Controller. Up to eight test states can be handled by two units of 916 W/I Controllers connected in a master-slave mode.

(2) Set a master unit and a slave unit as follows:

- ① Designate one of the two units as a master unit and the other as a slave unit.
- ② Set the MASTER/SLAVE switch ((E) in Figure 4.1) of the master unit to MASTER and that of the slave unit to SLAVE.

(3) Set the contents of test as follows:

- ① Set the contents of test states 1 - 4 with the master unit.

- ② Set all TEST END/TO NEXT switches ((D) in Figure 4.1) of the master unit to TO NEXT.
  - ③ Set the contents of test states 5 - 8 with the slave unit, by assigning nominal state numbers 1 of the slave unit to actual state number 5 of the test, and nominal state numbers 2/3/4 to actual state numbers 6/7/8, respectively.
  - ④ If the required number of states is less than eight, set the TEST END/TO NEXT switch of the final one of the required states to TEST END.
- (4) For the connections among the system components for a master-slave mode of operation, see Figure 4.3.
  - (5) System operation (test start and system reset) can be controlled with the TEST/RESET buttons or with a remote control signal applied through the remote control connector of the master unit. The TEST button of the slave unit remains disabled. For system reset, the RESET buttons of both master and slave units remain enabled.
  - (6) Note the following for the master-slave mode of operation:
    - ① Keep the OPERATE ON/OFF switch of the slave unit set to ON.
    - ② Do not attempt to apply a remote control signal through the TEST/RESET REMOTE CONTROL connector of the slave unit. If you do this, the sequence control function of the system may be disturbed and tests may occur in an unpredictable sequence.
    - ③ Up to four different test voltages can be preset with the 874 as the number of its channels is four. Therefore, the system cannot provide five or more different test voltages.  
When five or more states are to be preset, some of them should be of the same test voltage as called out from the same channel of the 874.

□ Output Signals

- (1) The 916 W/I Controller delivers the STATE END signals and TEST signals. The timing of these signals are as shown in the timing chart in Section 2 "SPECIFICATIONS".
- (2) Each of the signals is a contact signal, with contact ratings 100 VAC, 1 A, or 30 VDC, 1 A. The signals are delivered via the SIGNAL OUT connector on the rear panel. The connector pin assignment and layout are as shown in Figures 4.4 and 4.5.

SIGNAL OUT Connector (ST: Stands for "state")

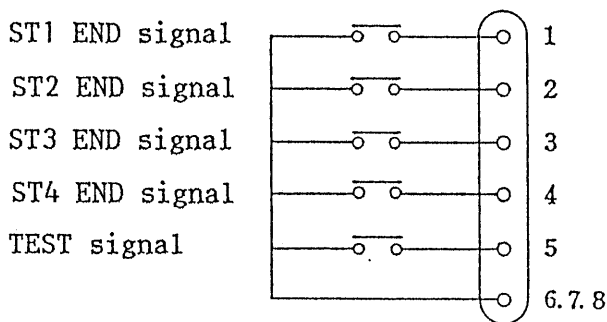


Figure 4.4 Connector Pin Assignment

As viewed from chassis rear

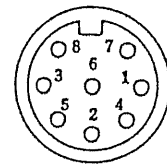


Figure 4.5 Connector Pin Layout

- (3) To control the tools and jigs for the tested objects by making use of the TEST END signals, the control actions must be completed within the period ( $T_c$ ) shown in Figure 4.6.

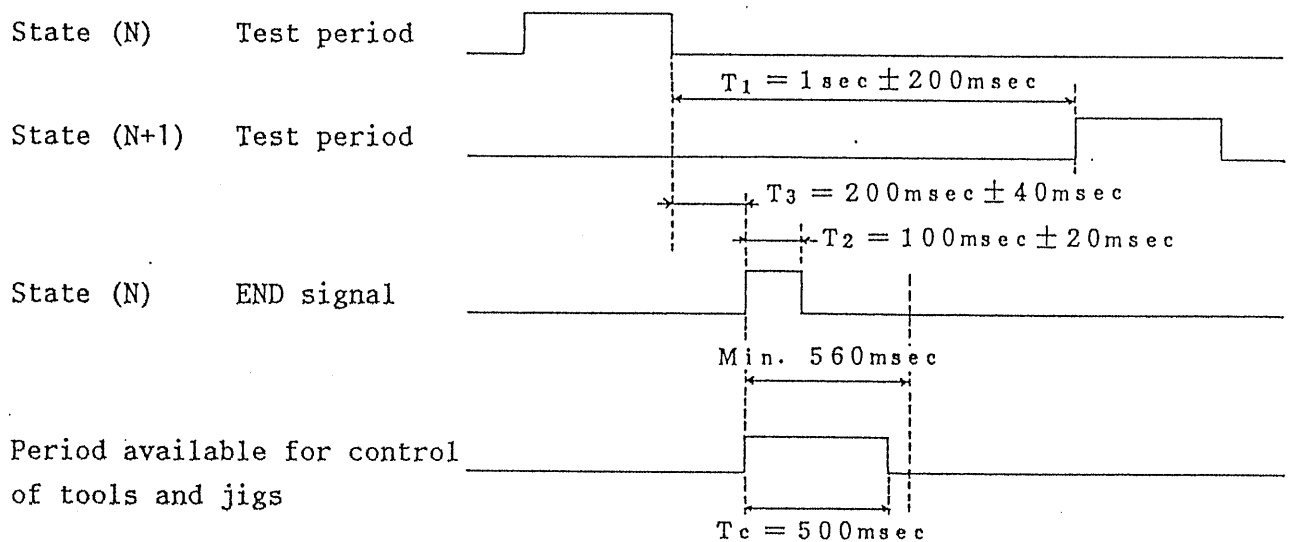


Figure 4.6

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As can be seen in the above timing chart, the minimum period from the occurrence of a STATE END signal to the start of test of the next state is 560 msec, taking the accuracies of timing also into consideration. Taking a certain safety margin of time into account, control actions of tools and jigs (including the time required for movement of the tools and jigs) must be completed within 500 msec ( $T_c = 500$  msec).

Note: Note that the tools and jigs may be damaged and the system operation may fail due to noise if the tools and jigs are driven during the TEST ON period.

System with the 916 W/I Controller and the 871 W/I Tester

- (1) Up to this point in this manual, a system which is comprised of the 916 W/I Controller, the 871 W/I Tester, and the 874 Output Voltage Remote Controller has been assumed. In the following, a system without the 874 Output Voltage Remote Controller is described.
- (2) When the 874 is not employed, the system is without the remote control function of the test voltages for W-test.

However, when only a single test voltage is required and the 874 for maintaining the voltage accuracy is not required, various withstanding voltage tests and insulation resistance tests can be done with a system consisting only of the 916 and the 871.

- (3) The connections of the system components are identical with those shown in Figures 4.2 and 4.3, except that the items related to the 874 Output Voltage Remote Controller are to be eliminated.
- (4) The test voltage for W-test can be set with the TEST VOLTAGE dial on the front panel of the 871. Since the 916 is not required to specify any channel numbers of the 874, leave the CHANNEL SELECT DIP switches ((E) in Figure 4.1) in any arbitrary positions.
- (5) Other items, including the performance specifications, are identical with the case that the 874 is included.