

BK PRECISION DYNASCAN
CORPORATION

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INSTRUCTION MANUAL



BK PRECISION **552**

CMOS IC TESTER

BK PRECISION DYNASCAN
CORPORATION

TEST INSTRUMENT SAFETY

WARNING

Normal use of this test equipment exposes you to a certain amount of danger from electric shock because it is sometimes used with equipment containing high voltage. An electric shock causing 10 milliamps of current to pass through the heart will stop most human heartbeats. Voltage as low as 35 volts dc or ac rms should be considered dangerous and hazardous since it can produce a fatal current under certain conditions. Higher voltages are even more dangerous. Observe the following safety precautions:

1. Don't expose high voltage needlessly. Remove housings and covers only when necessary. Turn off equipment while making test connections in high-voltage circuits. Discharge high-voltage capacitors after removing power.
2. If possible, familiarize yourself with the equipment being tested and the location of its high voltage points. However, remember that high voltage may appear at unexpected points in defective equipment.
3. Use an insulated floor material or floor mat to stand on, and an insulated work bench surface; make certain such surfaces are not damp or wet.
4. Keep "one hand in the pocket" while handling an instrument probe. Be particularly careful to avoid contacting a nearby metal object that could provide a good ground return path.
5. Some equipment with a two-wire ac power cord, including some with polarized power plugs, is the "hot chassis" type. This includes most recent television receivers and audio equipment. A

(continued on inside rear cover)

Instruction Manual For

BK PRECISION

Model 552 CMOS IC TESTER

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TABLE OF CONTENTS

	Page		Page
TEST INSTRUMENT SAFETY Inside Front Cover		CONSIDERATIONS	15
INTRODUCTION	1	APPLICATIONS	19
FEATURES	3	Troubleshooting Technique	19
SPECIFICATIONS	4	Out Of Circuit IC's	20
CONTROLS AND INDICATORS	5	Manual Select Switches	20
OPERATING INSTRUCTIONS	8	IC Clips	20
Operating Precautions	8	CIRCUIT DESCRIPTION	22
CMOS Handling Precautions	8	MAINTENANCE	25
Power Connections	9	Assembling The IC Clip	25
LED Test	10	WARRANTY SERVICE INSTRUCTIONS	27
Connecting The IC Clip	10	LIMITED ONE YEAR WARRANTY	28
Logic Monitor Mode	11		
IC Test Mode	12		

INTRODUCTION

The Model 552 CMOS IC Tester is a compact, easy-to-use, hand-held instrument that can be used as either a 20-pin logic monitor or an in-circuit CMOS IC Tester (using the comparator method). It is capable of testing most 4000 series CMOS devices. Because the IC Tester draws so little current, it can usually draw it's power from the equipment that you wish to test. To help prevent accidental damage to the IC Tester, reverse polarity protection is provided.

The IC Tester comes with two IC clips, one that can be used for IC's with 20 pins or less, and one that can be used in tighter spaces for IC's with 16 pins or less. Also provided, is a list of testable IC's and the data necessary for testing those IC's.

When used as an IC Tester, it compares the logic states of the IC under test with those of a known good reference IC. If all logic states are equal, a GOOD indicator lights. If not, an LED is lit for each pin of

non-equal logic states. By allowing you to test IC's while still in the circuit, the IC Tester helps you to avoid the time consuming task of removing each device from the circuit board. It also helps you avoid the risk of damaging the IC or the PC board when removing or reinstalling the device.

For standard IC's, pushbuttons for 14, 16, 18 and 20 pin IC's select the VSS and VDD pins. A MAN button permits individual pin selection for any other VSS and VDD pin configuration. A single LED on the IC Tester indicates if the IC being tested is good. If the IC Tester determines that the IC is defective, the defective pins are indicated. The IC Tester's memory feature captures short duration or intermittent errors.

When used as a logic monitor, the IC Tester indicates the logic state of each IC pin for CMOS IC's with up to 20 pins. Logic high is indicated by a lit LED and logic low is indicated by an extinguished LED. This

function continuously monitors each pin of the device and therefore follows changing as well as constant logic states. When compared to using a standard logic

probe that can check only one IC pin at a time, the IC Tester is much faster for checking the logic states of IC's that are suspected of malfunctioning.

- Tests most CMOS IC's.
- Tests IC's With Up To 20 Pins.
- In-Circuit Dynamic Testing.
- 20-Channel Logic Monitor.
- Convenient One Button Selection For Testing Most IC's.
- Reverse Polarity Protection.
- Low Power Requirements: Uses Equipment Under Test's Power Supply.
- Memory Feature Stores Short Duration Pulses And Intermittent Events.
- 20-Pin IC Clip And 16-Pin IC Clip For Tight Spaces.
- Zero Insertion Force Reference IC Socket.
- LED at each IC pin to identify where error occurred.

Operating Modes:

Test Method:

IC Capacity:

Input Impedance:

Frequency Response:

Minimum Detectable Input Pulse Width:

Input Protection:

Indicators:

Power Requirements:

Dimensions:

Weight:

Accessories Supplied:

20 pin IC clip with cable.

Optional Accessories:

4

A detailed line drawing of a digital multimeter. The device has a rectangular body with a display screen at the top showing '55.2'. Below the screen is a 'MANUAL SELECT' switch with 'ON' and 'OFF' positions. To the left of the switch is a 'RANGE IC Tester' label. The main body is divided into two sections by a vertical line. The left section contains a large analog scale with a needle and a '0' mark. The right section contains a digital display with a 'TEST' button. Below the digital display is a 'PINK' button. On the right side of the device, there are several test leads connected to terminals labeled '40', '10', '5', '50', 'MAN/LOG', '50', and 'TEST'. The device is shown with two test leads: one with a probe tip (labeled 9) and another with a different probe tip (labeled 7). The device is also connected to a power source (labeled 8) via a cable (labeled 11). The device is shown with a carrying case (labeled 5) and a carrying strap (labeled 12).

5

- 1. **LOGIC/LED TEST Switch.** When this switch is depressed, the IC Tester is in the logic monitor mode of operation. If the IC clip is connected to an IC, the Tester will act as a 20-pin logic monitor. If the IC clip is not connected to an IC, all the LED's should light for the "LED test".
- 2. **MAN Switch.** When this switch is depressed, the IC Tester is in the manual IC test mode and VSS and VDD pins must be selected manually.
- 3. **Standard Pin Switches.** These switches are for "standard IC's" and each switch corresponds to the total number of pins on the IC under test. When one of these switches is depressed, the IC Tester is in the IC test mode and the VSS and VDD pins are automatically selected. All of the **MANUAL SELECT** switches must be in the off position when using the standard pin switches.
 - 14 Pin Switch.** When this switch is pressed, 14 pin IC's may be tested. The VSS and VDD pins selected are 7 and 14 respectively.
 - 16 Pin Switch.** When this switch is pressed, 16 pin IC's may be tested. The VSS and VDD pins selected are 8 and 16 respectively.

- 18 Pin Switch.** When this switch is pressed, 18 pin IC's may be tested. The VSS and VDD pins selected are 9 and 18 respectively.
- 20 Pin Switch.** When this switch is pressed, 20 pin IC's may be tested. The VSS and VDD pins selected are 10 and 20 respectively.
- 4. **TEST Switch.** When this switch is depressed and the IC Tester is in the IC test mode, the reference IC is compared with the IC connected to the IC clip.
- 5. **Pin Indicator LED's.** When the IC Tester is in the logic monitor mode of operation, these LED's indicate the logic state of the corresponding IC pins. When the IC Tester is in the IC test mode, the lit LED's indicate which pins are in error.
- 6. **MANUAL SELECT Switches.** When in the MANUAL mode of operation, these switches select the VSS and VDD pins for the IC under test. The numbers for the bank of switches on the left directly correspond to the pin number of the IC (1 through 10). The bank of switches on the right correspond to the IC pin numbers as follows:

Switch #	Pin # on 14 pin IC	Pin # on 16 pin IC	Pin # on 18 pin IC	Pin # on 20 pin IC
11	NA	NA	NA	11
12	NA	NA	10	12
13	NA	9	11	13
14	8	10	12	14
15	9	11	13	15
16	10	12	14	16
17	11	13	15	17
18	12	14	16	18
19	13	15	17	19
20	14	16	18	20

- 7. **VSS Test Clip.** This black clip is connected to common (VSS) of the circuit under test.
- 8. **IC Test Clip And Cable.** This cable with 16-pin or 20-pin clip connects the IC Tester to the IC to be tested.

CAUTION

Do not connect the IC clip to any IC with more than +18 V or

- less than 0 V present at any of its pins. Doing so could damage the IC Tester or the IC under test.
- 9. **VCC Test Clip.** This red clip is connected to VDD (+5 to +18 V) of the circuit under test.
- 10. **Zero Insertion Force Socket.** Socket for reference IC.
- 11. **Reference IC Lock Down Lever.** When the lever is up (perpendicular to the IC Tester), the IC socket is open and an IC can be inserted or removed. When the lever is down (parallel to the IC Tester), the IC is locked into the socket.
- 12. **GOOD LED.** When no reference IC is plugged into the IC socket and the IC test mode is selected, this LED indicates that a connection has been made between the IC clip and the IC. When a reference IC is plugged into the IC socket, the IC test mode is selected, and the TEST switch is pressed, this LED indicates that the IC under test is good (if it is on).

OPERATING INSTRUCTIONS

OPERATING PRECAUTIONS

CAUTION

The following precautions will help avoid damage to the IC Tester.

1. Before connecting the IC Tester to the unit under test's power supply, verify that the polarity is correct and that the voltage is not above +18 V. While this unit offers polarity protection, the protection is limited; and correct polarity should always be observed. Always connect the red test clip to the positive supply (VDD) and the black test clip to the circuit common (VSS). Exceeding the reverse protection ratings of the IC Tester could cause damage to the IC Tester, the unit under test, and the reference IC.

2. Never connect the IC clip to any IC that has voltages higher than +18 V or lower than 0 V. Connecting the IC Tester to voltages higher than +18 V or lower than 0 V could damage the IC Tester and the reference IC.

CMOS HANDLING PRECAUTIONS

CAUTION

CMOS IC's can be destroyed by static electricity discharge. The following handling precautions are recommended by CMOS IC manufacturers and should be taken to help avoid damage to CMOS devices:

1. CMOS components should be transported and stored in materials that are somewhat conductive

and should never be inserted into conventional foam or plastic trays.

2. CMOS components should be placed on a grounded surface and handlers should ground themselves (since they can be statically charged).
3. Nylon clothing should not be worn while handling CMOS components.
4. Never insert or remove CMOS components from sockets with power applied.
5. When lead straightening is necessary, provide ground straps for the device used.

POWER CONNECTIONS

1. Connect the red test clip to the positive supply (VDD) and the black test clip to the circuit common (VSS) of the unit that you wish to test. If the power supply polarity is incorrect, the IC Tester will not turn on.

NOTE

Do not connect the test clips to the VSS or VDD pins of an IC. IC pins are too close together to allow the test clips to be connected to them without a risk of being shorted against another pin on the IC. It is best to connect the clips to positive supply (VDD) and common (VSS) test points or to larger resistor or capacitor leads that are connected to VDD or VSS.

If the power supply for the unit under test is not capable of supplying an additional 69 mA for the IC tester, it will be necessary to connect another power supply in parallel. Match the voltage of the auxiliary power supply to that of the unit under test and connect the two circuit commons together. Connect the

clips to the positive supply and common of the auxillary power supply.

LED TEST

Conducting this test before each use is performed will verify that all the IC Tester's LED's are operating.

1. Connect the IC Tester to the unit under test's power supply.
2. With no IC connected to the IC clip and no reference IC in the IC Tester's socket, press the **LOGIC/LED TEST** switch. All the LED's on the IC Tester should light.

CONNECTING THE IC CLIP

When connecting the IC Clip to the IC under test, be sure to connect pin 1 of the IC clip to pin 1 of the IC under test. Fig. 2 shows the correct way to connect the clip to the IC under test.

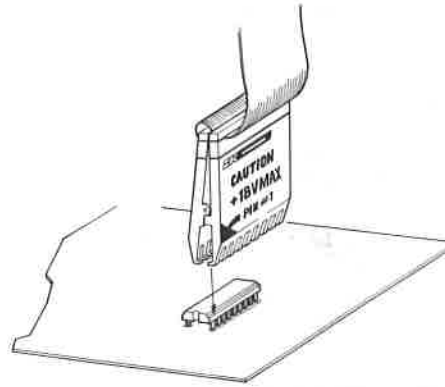


Fig. 2. Connecting The IC Clip.

NOTE

The 20 pin IC clip may be used for all IC testing (including those

with less than 20 pins). However, if clearance around the IC is too tight, the 16-pin IC clip may be used to test IC's with 16 pins or less.

LOGIC MONITOR MODE

In the Logic Monitor Mode, the IC Tester can be used as a 20-pin logic monitor. The 20 LED's are connected to the IC under test via the IC clip.

1. Connect the IC Tester to the unit under test's CMOS power supply.
2. With no reference IC in the IC Tester's socket, connect the IC clip to the IC that you wish to test and press the **LOGIC/LED TEST** switch.
3. Each of the 20 LED's now shows the logic state of the corresponding IC pin. The LED's that correspond to leads that are not present on the IC under test will remain on. For example, if a 14 pin IC is being tested, the bottom three LED's in

each row will remain on. The other LED's will show the present state of the corresponding pins on the IC. When an LED is on, a high logic signal is indicated and when the LED is off, a low logic signal is indicated. Also, keep in mind that when a pin is alternating between high and low logic at a fast rate, the LED will appear to be constantly on (although the LED will usually appear to be dimmer).

IC TEST MODE

To properly test an IC, the device must be in use and the inputs and outputs should have changing logic states. See the **CONSIDERATIONS** section of this manual for more details.

Set Up

In the IC Test Mode, the IC tester compares a known good IC (of an identical type) to an IC that is questionable (in the circuit being tested). For example, if a 4030 is suspected of malfunctioning, a known good 4030 would be used as the reference IC.

Connect the IC Tester to the unit under test's power supply.

After performing this first step, it is necessary to determine whether the IC that you wish to test is of "standard" or "non-standard IC pin configuration". Standard IC pin configuration to the IC Tester is when VSS is at the last pin in the first row (e.g., pin 7 for a 14 pin IC, pin 8 for a 16 pin IC, pin 9 for an 18 pin IC, and pin 10 for a 20 pin IC) and VDD is connected to the last pin in the second row (e.g., pin 14 for a 14 pin IC, pin 16 for a 16 pin IC, pin 18 for an 18 pin IC, and pin 20 for a 20 pin IC). Refer to the Standard IC Pin Configuration section of this manual for "standard IC's". For IC's with VDD and VSS at pins other than these, refer to the Non-Standard IC Pin Configuration section of this manual.

Standard IC Pin Configuration: After performing step 1 from the "Set Up" section, press the **14**, **16**, **18**, or **20** switch that corresponds to the number of pins on the IC under test. The **MANUAL SELECT** switches must all be in the off position when using the standard IC pin configuration switches.

12

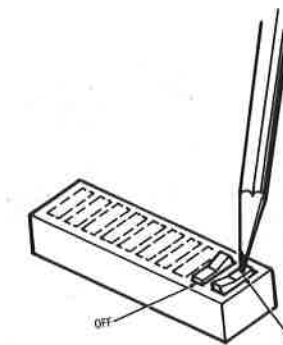
Non-Standard IC Pin Configuration: After performing step 1 from the "Set Up" section, check the IC table to identify the VSS and VDD pins for the IC under test. The VSS and VDD pins are selected by turning on the appropriate switches at the top of the IC Tester. To turn on a switch, press the top of the switch down firmly using a pen or other small pointed object. Fig. 3 shows how to set the **MANUAL SELECT** switches. For IC pins 1 through 10, the left group of switches corresponds directly with the IC pin numbers (e.g., to select VDD at pin 5 of any IC, the 5 switch should be selected). For IC pins 11 through 20 however, the switch must be selected according to the total number of pins present on the IC. The easiest way to select the proper switch is to use the vertical row of numbers on the right half of the IC Tester. Locate the vertical row that corresponds to the number of pins that the IC has (e.g., for a 14 pin IC, the row of numbers at the left would be the correct one) and move down to the desired pin number. Then move to the row of numbers all the way to the right on the IC Tester. This will be the switch number that corresponds to the IC pin (e.g., if pin

10 of a 14 pin IC was the VSS pin, switch 16 should be selected). Also, Table 1 can be used to select the proper switch. To use the table, go to the column that corresponds to the total number of pins on the IC and find the correct pin number in that column. Next, move straight across to the column labeled "switch #" (all the way to the left). This will be the switch number that corresponds to the IC pin.

Switch #	Pin # on 14 pin IC	Pin # on 16 pin IC	Pin # on 18 pin IC	Pin # on 20 pin IC
11	NA	NA	NA	11
12	NA	NA	10	12
13	NA	9	11	13
14	8	10	12	14
15	9	11	13	15
16	10	12	14	16
17	11	13	15	17
18	12	14	16	18
19	13	15	17	19
20	14	16	18	20

Table 1. Manual Switch Selection.

13

Fig. 3. Setting the **MANUAL SELECT** switches.

Inserting The Reference IC And Performing The Test

CAUTION

Never insert or remove CMOS IC's from the reference IC socket when the IC clip is connected to the IC under test. Doing so may damage the reference IC.

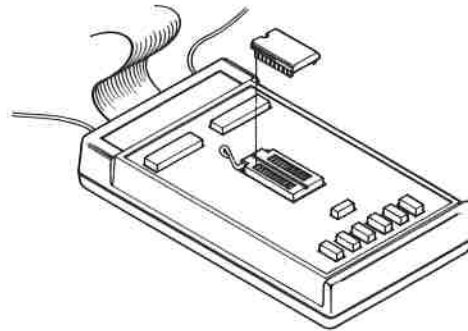


Fig. 4. Inserting The Reference IC.

1. With the lock down lever in the up position, insert a known good IC (identical to the one under test) into the zero insertion force socket on the IC Tester. Make sure that pin 1 of the IC is located at the upper left hand corner of the IC socket on the IC tester as shown in Fig. 4.
2. Lock down the reference IC by pushing the lock down lever toward the top of the IC Tester until the lever is parallel to the IC socket.
3. Connect the IC clip to the IC that you wish to test.
4. Press the **TEST** button. If the **GOOD** LED lights, the IC is good. If the **GOOD** LED fails to light, the IC is bad. For bad IC's the red LED's will light at pins that show error.

Logic devices can be placed in two categories, those that are considered combinational (such as gates and inverters), and those that are considered sequential (such as flip-flops and registers). Those devices that are combinational are easier to test using the logic comparator method (the method used with the 552 IC Tester as well as many other logic comparators and IC testers) than those that are sequential. This is because devices that are combinational have a change at the output at practically the same instant that the input(s) is changed. Sequential devices usually have an internal delay or internal storage that complicates the testing process because the device under test and the reference device must be synchronized and have the same data present inside. The considerations that follow are a brief run down of problems that may be encountered when certain devices are tested while operating in certain conditions.

DYNAMIC TESTING

In order to properly test an IC, the device must be in use and the inputs and outputs should have changing states. If, for example, an IC output pin is shorted to ground, but the output of the IC is supposed to be low (due to the input data), the IC will show up on the IC Tester as **GOOD**. By making sure that all of the IC's inputs are active (changing states), this situation will be avoided.

OPEN CIRCUITED OUTPUTS

When an IC with an open circuited output is tested, false test results may occur. This is because a resistor is connected between the reference IC pin and the pin of the IC under test. The resistor allows the logic sig-

nal present at the output of the reference IC to also be seen at the output of the IC under test. Because the same logic is seen at the output of both devices, the IC Tester shows the IC under test to be **GOOD** even though it is not.

EXTERNAL COMPONENTS

Testing IC's that use external timing capacitors and resistors (such as one shots or multivibrators) is not recommended. Because the IC Tester ties the reference IC to the IC under test, the external capacitance and resistance are thrown off by the IC Tester. This may cause the circuit under test to operate improperly, resulting in erroneous test results.

LOADING BEYOND RATED FANOUT

In cases where the IC under test has been loaded close to its rated fanout, the IC Tester may further load the circuit under test (beyond the IC's rated fanout) and cause it to malfunction, possibly resulting in false test results.

TRI-STATE DEVICE

When the IC under test is a tri-state device, erroneous test results may occur. The IC Tester compares logic signals between the device under test and the reference IC, but a tri-state device in the high impedance state has no logic output. Because the IC Tester does not actually test the high impedance state of the device (it compares logic levels when the device is in the logic high or logic low state), only the low and high logic states can be tested.

EDGE TRIGGERED DEVICE

In some cases when high speed edge triggered devices (flip-flops, counters, etc...) are being tested, erroneous test results may occur. Because of the IC Tester's test cable and internal circuit board wiring, the device under test may trigger sufficiently before the reference IC to cause an erroneous reading.

POSSIBLE ANALOG USE

Some IC's are usable for both digital and analog applications. If the device is used for analog signals,

the IC Tester is not capable of testing the device (when used for this application). Also, many devices that can be used to switch analog signals can withstand voltages higher than +20 and lower than -0.5. Testing devices used with such signals could result in damage to the IC Tester.

COUNTER, SERIAL OR SHIFT REGISTER, OR FLIP-FLOP

If an IC that is a counter, flip-flop, or serial or shift register does not show to be **GOOD** when first tested, resetting the IC's (both the IC under test and the reference IC) may be all that is necessary. Because the reference IC is plugged into the socket after the equipment under test is already running, the IC under test and the reference IC may not be in sync. Frequently, both devices can be reset by turning the power to the unit under test off and then powering up again. If this fails to give a **GOOD** indication after pressing the **TEST** button, it is necessary to reset the IC's manually. To reset most devices, either a high or low (depending on whether the RESET pin is "active high" or "active low") logic pulse must be applied to the RESET pin (or in the case of multiple counter IC's,

there may be more than one RESET pin). The following IC chart indicates both the RESET pin number(s) and whether a high or low logic pulse is needed to reset the device. Because both the IC under test and the reference IC are tied together, it is only necessary to pulse the IC under test. To reset the IC it is best to use a Digital Pulser Probe such as the B & K-Precision Model DP-101. As an alternative, it is possible to use a wire jumper to connect the RESET pin to VSS or VDD. However, this method is not recommended because it is so easy to accidentally short a wire jumper to another pin on the IC. If a wire jumper is used, it is only necessary to connect the RESET pin to VSS or VDD for a very brief period. When the symbol "@@" appears in the "CLEAR PIN #" column, it is necessary to check the data sheets for the device under test (method for "resetting" or "clearing" the device is not simply applying a pulse to a reset pin).

STORAGE DEVICE

When testing memory devices (RAMs and ROMs), registers, or latches it is necessary that all data contained in the device under test also be contained in the

reference IC. With registers and latches, this is usually achieved by simply clearing or setting the device in much the same manner as with counters. If a SET, RESET, or CLEAR pin(s) is present on the device, the pin(s) is listed on the IC chart along with whether the pulse needed is logic high or logic low. For other devices it will be necessary to consult the data sheet for that specific device to determine how to match the data in the reference IC with that in the IC under test.

OPEN DRAIN DEVICE

When an open drain device does not have external pull-up resistors tied to its outputs, a high logic state (at the output) is seen as a high impedance (same as the third state in a tri-state device). See the consideration titled "TRI-STATE DEVICE" for such appli-

cations. If an external pull up resistor is used, the device acts as a normal logic device (logic high/logic low) but erroneous test results may still occur. While the IC Tester is capable of testing some open drain IC's, in certain conditions open drain IC's are not testable because of the high impedance at the output. This high impedance will cause the reference IC to override an open (blown) output on an open collector IC.

DEVICE CAN BE USED AS AN OSCILLATOR

Some devices have a secondary use as an oscillator. When such devices are used as an oscillator, external components (resistors and capacitors) are used and the device cannot be tested by the IC Tester.

TROUBLESHOOTING TECHNIQUE

Using the Model 552 IC Tester in conjunction with an oscilloscope, a DMM, and a logic pulser, will allow you to troubleshoot digital instruments quickly and efficiently. As with other electronic instruments, a standard troubleshooting technique should be followed. This includes the usual first step of checking the power supply voltage and checking for a noisy power supply line or poor grounding.

When working with discrete logic circuits it is important to remember to work forward through the unit being tested rather than working backwards. This is because the IC's must be operating in order for the IC Tester to check them. If an IC toward the beginning of a logic path is malfunctioning, all IC's that follow the defective IC will probably not have changing logic states (due to the lack of changing logic signals from the defective IC). As mentioned in the **CONSIDERATIONS** section of this manual, if the logic states

are not changing, false test results may occur. Of course when testing bus configuration type logic circuits, testing in this manner may not be possible.

Generally it is not necessary to test each IC in a malfunctioning circuit. Usually, using schematic and block diagrams, a few suspected IC's can be isolated as the possible problem. These suspected IC's should then be checked using the IC Tester. Check the IC chart or the **CONSIDERATIONS** section of this manual for problems that may occur with the particular device that you are testing. If one or more of the considerations listed in the manual apply to the device under test and false test results are suspected, the logic monitor mode of the IC Tester should be used to check that the logic states of the device are changing as they should. If the clock speed of the IC under test is too fast (or the duty cycle is too low), the Logic Monitor's LED's may appear to be constantly lit and it may be necessary to use an oscilloscope to check the outputs.

OUT-OF-CIRCUIT IC'S

This instrument can also be used as an out-of-circuit IC tester when the right technique is used. In this case, the location of the reference IC and the IC under test are essentially reversed. The in-circuit IC to which the clip is connected becomes the known-good reference IC, and the IC plugged into the socket on the tester becomes the IC under test. Naturally, both IC's must be of the same type, the in-circuit IC must be known good, and the in-circuit IC should be "exercised" with changing logic states (dynamic operating condition). Since the tester is a logic comparator, it doesn't care which IC is the known good reference, it merely indicates whether there is any difference between the two. Depending on whether or not any differences are detected, the IC Tester will indicate "GOOD" or show which pins are in error.

MANUAL SELECT SWITCHES

When testing some devices, it may be desirable to tie the inputs of the reference IC directly to the inputs of the IC under test. To connect the inputs together,

the **MANUAL SELECT** switches that correspond to the input pins should be turned on. This can be done in either the **MANual** mode of operation or when the **14, 16, 18, or 20** switch is selected. Remember that when using the **MANual mode of operation**, the VSS and VDD switches must also be selected. Use the chart (Table 1) in the **OPERATING INSTRUCTIONS** section of the manual to figure out which switches correspond to the correct pins on the IC's. It is important that only the VSS, VDD, and input terminals be tied directly together (do not tie the outputs together using the **MANUAL SELECT** switches). When the output of the reference IC is tied directly to the output of the IC under test, the logic states at one device's output might be seen at the other device's output even when the IC under test is malfunctioning.

IC CLIPS

Some products that use CMOS IC's may have components packed so tightly that the 20 and 16 pin IC clips may not be usable with 18, 14, or 8 pin IC's. The following "AP-Products" connector compatible IC test clips can be used in such situations. Although B & K-

NUMBER OF PINS	AP-PRODUCTS PART NUMBER
8 - PIN	923690-08
14 - PIN	923690-14
18 - PIN	923690-18

"AP-Products" Connector Compatible IC Test Clips (With Long Headless Leads).

Precision does not supply these clips, they should be easily obtainable from your parts supplier. Be sure to use the part numbers listed (they are for the "long, headless lead" clips - the "nail head leads" are not connector compatible and will not fit the cables supplied with the IC Tester). The 16 or 20 conductor ribbon cable (supplied with the 16 and 20 pin IC clips, respectively) can be used with these clips. Refer to the **MAINTENANCE** section of this manual for installation information (the new clips will not have pin one marked but pin one will still be at the end of the clip that is connected to the end of the cable with the red band).

CIRCUIT DESCRIPTION

Refer To Separately Supplied Schematic Diagram

The Model 552 IC Tester consists of 18 identical circuit blocks (1 through 9 and 11 through 19) each consisting of one IC_A, IC_B, IC_C, D_A, D_B, C_A, R_A, R_B, R_C, R_D, and R_E and two identical circuit blocks (10 and 20) each consisting of one IC_A, IC_B, IC_D, D_A, D_C, C_A, R_A, R_B, R_C, R_D, and R_E. To make this circuit description less complicated, reference will only be made to two blocks (one in the 1 through 9 and 11 through 19 group and one in the 10 and 20 group). The first group of blocks (block 1 through 9 and 11 through 19) will be referred to as group A and the second group (blocks 10 and 20) will be referred to as group B throughout this circuit description. Each block in group A consists of identical components and operates exactly the same and each block in group B consists of identical components and operates exactly the same.

LOGIC MONITOR MODE

When the Logic Monitor mode of operation is selected, switch S201 - 6 is depressed. This ties the E line to ground enabling IC_C in group A and IC_D in group B. In group A the signal from the IC clip is inverted by IC_C and fed to the cathode of D_A. In group B the signal from the IC clip is inverted by IC_D and fed to the cathode of D_C (which has its anode tied to the cathode of D_A). The anode of D_A is tied to the positive voltage supply through R_B, Q202, Q203, and Q204.

When a low logic signal is present at the IC clip, the signal is inverted by IC_C in group A and by IC_D in group B. The resulting high signal is fed to the cathode of D_A which does not light because a high logic

signal (the positive voltage supply) is also present at the anode. When a high logic signal is present at the IC clip, it is inverted to a low logic signal (by IC_C for group A and IC_D for group B) and fed to the cathode of D_A. This causes the LED (D_A) to light because the potential at the anode is higher than at the cathode.

LED TEST

When no signal is present at the IC clip, IC_C (for group A) and IC_D (for group B) sees a high logic signal at the IC clip. As explained previously, this high logic signal causes D_A to light. When the E line is tied to ground, Q202 is turned off and Q201 is turned on, allowing current to flow through D21, R226, and Q201 to ground. This causes the GOOD LED (D21) to light.

IC TEST MODE

When the IC test mode of operation is selected, either the MAN switch or one of the four IC pin number selector switches are selected. This breaks the connection between the E line and ground, which dis-

ables gate IC_C (in group A) (essentially removing it from the circuit) and causes the output of IC_D (in group B) to go high (so that diode D_C isolates IC_D from the output of IC_B, also essentially removing IC_D from the circuit).

The IC pin number selector switches (at the bottom of the IC Tester) select the VDD (ground or circuit common) and VSS (positive +5 to +18 V) pin by directly connecting the VDD pin of the reference IC to the VDD pin of the IC under test and the VSS pin of the reference IC to the VSS pin of the IC under test. When the MAN switch is depressed, the DIP switches at the top of the IC Tester are used to directly connect the VDD pin of the reference IC to the VDD pin of the IC under test and the VSS pin of the reference IC to the VSS pin of the IC under test.

The inputs and outputs of the reference IC and the IC under test are fed to exclusive NOR gates (IC_A - for both group A and group B). The outputs of the exclusive NOR gates are fed to a SET-RESET flip-flop (IC_B) whose output is fed to the cathode of an LED (D_A). As previously stated, the anode of the LED (D_A) is tied to the positive voltage supply through R_B, Q202, Q203, and Q204. Pressing the TEST button sets

the flip-flop (IC_A), causing the output to go high (or stay high if it already was). A high output from the flip-flop prevents the LED (D_A) from lighting.

When a difference between the reference IC and IC under test is detected, the output of the exclusive NOR gate goes to a low logic state. The low logic state resets the flip-flop, causing the output to go low. This lights the LED (D_A). When any of the diodes (D_A) light, Q202 turns on and D21 (the **GOOD LED**) is prevented from turning on. Capacitor C_A is provided to prevent very short duration pulses from resetting the flip-flop.

When no difference between the reference IC and the IC under test is detected, the output of the exclusive NOR gate is at a high logic state. The high logic state leaves the flip-flop set and the output of the flip-flop stays high. This prevents the LED (D_A) from lighting. When D_A is not lit, transistor Q202 turns off, allowing a path for current through D21 (the **GOOD LED**). Because at least one of the pins of the IC under test is at VDD (V+), Q201 is turned on. Current then flows through D21, R226, Q201, causing D21 (the **GOOD LED**) to light.

When no reference IC is inserted in the reference IC socket, the exclusive NOR gate sees matching signals at both its inputs (resistor R_C allows the logic signal from the IC clip to also be seen at the reference socket). The output of the exclusive NOR gate is therefore high, keeping the flip-flop set. The set flip-flop has a high output which prevents D_A from lighting. When current is not flowing through D_A, transistor Q202 is off. When Q202 is turned off, D21 (the **GOOD LED**) becomes the only path for current (if Q201 is on). If any of the pins of the IC clip are connected to VDD (V+), the V+ line is brought high and transistor Q201 turns on. This allows current to flow through D21, R226, and Q201 turning on D21 (the **GOOD LED**).

POWER SUPPLY

When the IC Tester's black and red test clips are connected correctly, Q203 is turned on. When the IC clip is connected correctly (with the +5 to +18 V supply on the last pin) and the **MAN** and **TEST/LOGIC** switches are disengaged, high logic signals are present at both inputs of IC204D. This causes a low at the output of IC204D which turns on transistor Q205. Cur-

rent then flows through Q203, Q205, and relay RY201, energizing the relay. When the relay is energized, a direct connection is made between the VDD pin of the reference IC and the VDD pin of the IC under test. This allows the reference IC to turn on. If any of these conditions are not met a 1.5 k Ω resistor (R222) is

connected between the reference IC and the IC under test to limit current (keeping current low enough to prevent damage to the reference IC). Diodes D223 and D224 regulate the power supply voltage for driving all LED's. The power for driving the logic circuits is taken directly off the unit under test's power supply.

ASSEMBLING THE IC CLIP

To attach the IC clip to the test cable, position the test cable so that the red band is on the side of the IC clip that is marked "PIN # 1" (as shown in Fig. 5). Line up the holes in the two black cable connectors with the pins protruding from the top of the IC clip and slide the black cable connectors onto the protruding pins.

NOTE

Be careful when pressing the cable connectors and clip together. Forcing the connectors onto the pins could result in bending the pins.

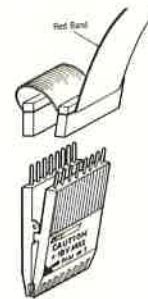


Fig. 5. Assembling The IC Clip.

1. Refer to the MAINTENANCE section of your **B & K-Precision** instruction manual for adjustments that may be applicable.
2. If the above-mentioned does not correct the problem you are experiencing with your unit, pack it securely (preferably in the original carton or double-packed). Enclose a letter describing the problem and include your name and address. Deliver to, or ship PREPAID (UPS preferred in U.S.A.) to the nearest **B & K-Precision** authorized service agency (see list enclosed with unit).

If your list of authorized **B & K-Precision** service agencies has been misplaced, contact your distributor for the name of your nearest service agency, or write to:

B & K-Precision, Dynascan Corporation
Factory Service Operations
6460 West Cortland Street
Chicago, Illinois 60635
Tel (312) 889-8870
Telex: 25-3475

Also use this address for technical inquiries and replacement parts orders.

DYNASCAN CORPORATION warrants to the original purchaser that its **B & K-Precision** product, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

DYNASCAN will, without charge, repair or replace, at its option, defective product or component parts upon delivery to an authorized **B & K-Precision** service contractor or the factory service department, accompanied by proof of the purchase date in the form of a sales receipt.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty registration card to **DYNASCAN, B & K-Precision**, 6460 West Cortland Street, Chicago, Illinois 60635 within fifteen (15) days from the date of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

DYNASCAN shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.

For your convenience we suggest you contact your **B & K-Precision** distributor, who may be authorized to make repairs or can refer you to the nearest service contractor. If warranty service cannot be obtained locally, please send the unit to **B & K-Precision** Service Department, 6460 West Cortland Street, Chicago, Illinois 60635, properly packaged to avoid damage in shipment.

B & K-Precision Test Instruments warrants products sold only in the U.S.A. and its overseas territories. In other countries, each distributor warrants the **B & K-Precision** products which it sells.

(continued from inside front cover)

plastic or wooden cabinet insulates the chassis to protect the customer. When the cabinet is removed for servicing, a serious shock hazard exists if the chassis is touched. Not only does this present a dangerous shock hazard, but damage to test instruments or the equipment under test may result. To make measurements in "hot chassis" equipment, always connect an isolation transformer between the ac outlet and the equipment under test. The B & K-Precision Model TR-110 or 1604 Isolation Transformer, or Model 1653 or 1655 AC Power Supply is suitable for most applications. To be on the safe side, treat all two-wire ac powered equipment as "hot

chassis" unless you are sure it has an isolated chassis or an earth ground chassis.

6. When testing ac powered equipment, remember that ac line voltage is usually present on some power input circuits such as on-off switch, fuses, **power transformer**, etc. any time the equipment is connected to an ac outlet, even if the equipment is turned off.
7. **Never** work alone. Someone should be nearby to render aid if necessary. Training in CPR (cardio-pulmonary resuscitation) first aid is highly recommended.