B+K PRECISION DYNASCAN CORPORATION

6460 West Cortland Street
Chicago, Illinois 60635

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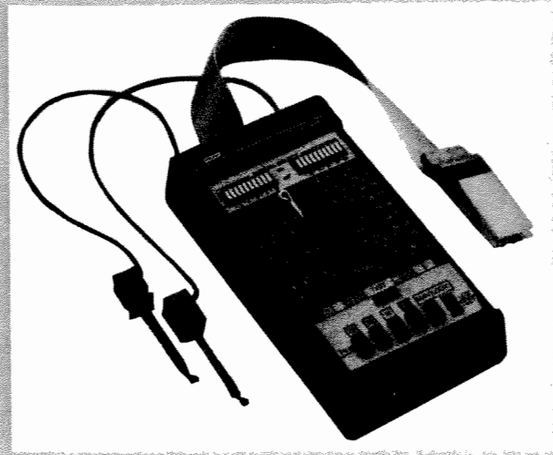
INSTRUCTION MANUAL



B+K PRECISION 550

TTL IC TESTER

B+K 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

B+K PRECISION

Model 550 TTL IC TESTER

B+K PRECISION DYNASCAN CORPORATION

6460 West Cortland Street
Chicago, Illinois 60635

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INTRODUCTION

The Model 550 TTL IC Tester is a compact, easy-to-use, hand-held instrument that can be used as either a 20-pin logic monitor or a TTL IC Tester. It is capable of testing most 54 and 74 series TTL devices including the Standard TTL, Schottky (S), Low Power Schottky (LS), Advanced Schottky (AS), Advanced Low Power Schottky (ALS), High Speed (H), and Fast (F) families. 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, both overvoltage and reverse polarity protection are 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 ground and VCC pins. A MAN button permits individual pin selection for any other ground and VCC 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 Testers 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 TTL 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.

FEATURES

- Tests most TTL IC's Including.
- 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 And Overvoltage 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 occured.

SPECIFICATIONS

Operating Modes:
Logic monitor and IC tester.

Test Method:
Compares logic levels of IC under test with logic levels of reference IC.

IC Capacity:
Up to 20 pin dual-in-line.

Input Impedance:
1 MΩ or greater/30 pF or less.

Frequency Response:
DC to 10 MHz.

Minimum Detectable Input Pulse Width:
150 ns.

Input Protection:
Reverse Polarity and Overvoltage to ±10 V DC.

Indicators:
21 Red LED's.

Power Requirements:
+5 ±0.25 V @ 125 mA derived from unit under test.

Dimensions:
1.7 x 3.7 x 7.0" (43 x 94 x 178mm).

Weight:
1 lb (0.45 kg).

Accessories Supplied:
16 pin IC clip with cable.
20 pin IC clip with cable.
Schematic diagram and parts list.

Optional Accessories:
Carrying case for single Model 550 (LC-5).
Carrying case for both Model 550 and 552 (LC-6).
Sample selection of reference TTL IC's (ICK-1).

CONTROLS AND INDICATORS

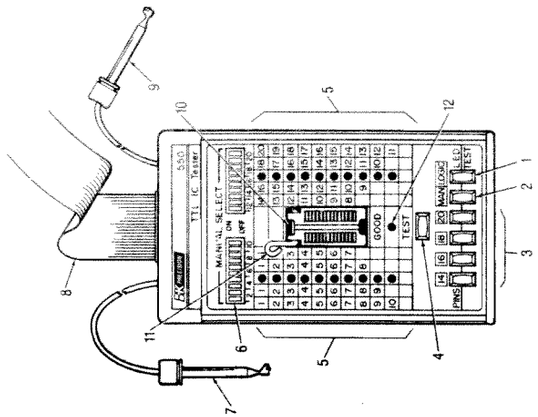


Fig. 1. Controls And Indicators.

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 ground and VCC 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 ground and VCC 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 ground and VCC pins selected are 7 and 14 respectively.

   16 Pin Switch. When this switch is pressed, 16 pin IC's may be tested. The ground and VCC pins selected are 8 and 16 respectively.

   18 Pin Switch. When this switch is pressed, 18 pin IC's may be tested. The ground and VCC pins selected are 9 and 18 respectively.

   20 Pin Switch. When this switch is pressed, 20 pin IC's may be tested. The ground and VCC 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 ground and VCC 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. **Ground Test Clip.** This black clip is connected to ground 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 +6 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 VCC (+5 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).

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 very close to the required +5 V. While this unit offers polarity and overvoltage protection, the protection is limited; and correct polarity and voltage should always be observed. Always connect the red test clip to the +5 V supply and the black test clip to the circuit ground. Exceeding the 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 +6 V or lower than 0 V. In some circuits, open collector TTL devices may be tied to a voltage higher than +6 V (to drive a relay for example). Never try to use this IC Tester to test such a device. Connecting the IC Tester to voltages higher than +6 V or lower than 0 V could damage the IC Tester and the reference IC.*

POWER CONNECTIONS

1. **Connect the red test clip to the +5 V supply and the black test clip to the circuit ground of the unit that you wish to test. If the power supply voltage is too high or polarity is incorrect, the IC Tester will not turn on.**

NOTE

Do not connect the test clips to the ground or VCC (+5 V) 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 +5 V and ground test points or to larger resistor or capacitor leads that are connected to +5 V or ground.

If the power supply for the unit under test is not capable of supplying an additional 125 mA for the IC tester, it will be necessary to connect another power supply in parallel. Match the voltage of the auxillary power supply to that of the unit under test and connect the two circuit grounds together. Connect the clips to the +5 V and ground 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 5 V 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.

NOTE

The 20 pin IC clip may be used for all IC testing (including those with less than 20 pins). How-

ever, 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.

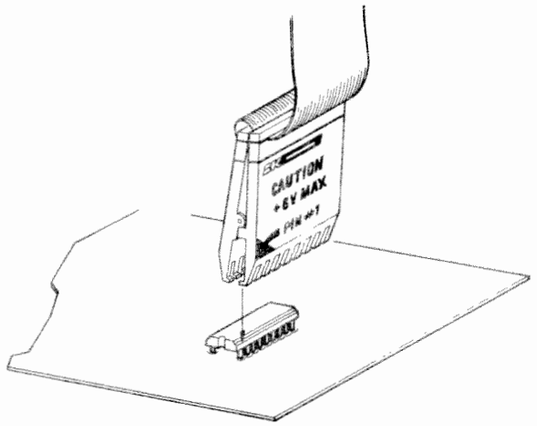


Fig. 2. Connecting The IC Clip.

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 5 V 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 74LS02 is suspected of malfunctioning, a known good 74LS02 would be used as the reference IC. You should not use a similar IC from a different family as a reference IC (for example, you would not use a 7402 in place of the 74LS02) even if the pin layout of the IC is identical.

1. Connect the IC Tester to the unit under test's 5 V power supply.

2. Connect the IC clip to the IC which you wish to test.

After performing these first two steps, 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 ground 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 VCC (+5 V) 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 VCC and ground at pins other than these, refer to the Non-Standard IC Pin Configuration section of this manual.

Standard IC Pin Configuration: After performing steps 1 and 2 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.

Non-Standard IC Pin Configuration: After performing steps 1 and 2 from the "**Set Up**" section, check the IC table to see what the ground and VCC pins are for the IC under test. The ground and VCC 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 VCC 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 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 ground 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 labled "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.

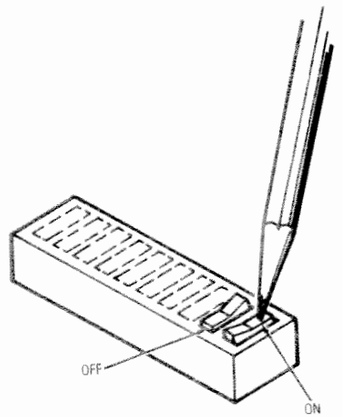


Fig. 3. Setting the **MANUAL SELECT** switches.

3. Press the **TEST** switch and the **GOOD** LED should light. If it does not, check the connection between the clip and the IC under test.

NOTE

Before the reference IC is inserted into the IC tester, the **GOOD** LED shows that some connection between the IC clip and ground has been made. It does not necessarily indicate that all connections are made correctly, it simply verifies that connection is made to ground on at least one of the IC pins.

Inserting The Reference IC And Performing The Test

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. Do not substitute a similar IC from a different family (e.g., do not substitute a 7402 for a 74LS02 or vice versa). Doing so could cause erroneous test results.

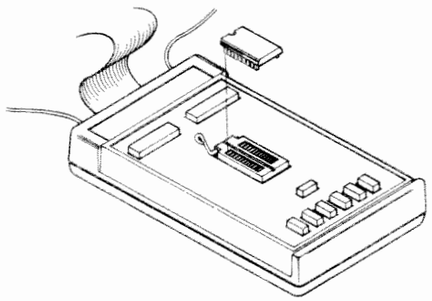


Fig. 4. Inserting The Reference IC.

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. 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 catagories, 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 550 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 signal present at the output of the reference IC to also be

seen at the output of the IC under test. Because the same logic signal 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.

COUNTERS AND FLIP-FLOPS

If an IC that is a counter or flip-flop does not show to be **GOOD** when first tested, reseting 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 counters 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 IC chart supplied with this tester 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 ground or VCC. 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 ground or VCC for a very brief period.

OPEN COLLECTOR DEVICES

If the IC under test is an open collector type, erroneous test results may occur. While the IC Tester is capable of testing some open collector IC's, in certain conditions open collector 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. Also, as stated in the PRECAUTIONS paragraph in these operating instructions, before testing an open collector device, make certain that the output is not tied to a supply that is higher than 6 V. Connecting the IC Tester to such a circuit could cause damage to the IC Tester and the reference IC.

TRI-STATE DEVICES

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 DEVICES

In some cases when high speed edge triggered devices (flip-flops and counters) 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.

STORAGE DEVICES

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 acheived 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 specification sheet for that specific device to determine how to match the data in the reference IC with that in the IC under test.

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.

TROUBLESHOOTING TECHNIQUE

Using the Model 550 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 descrete 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 "excercised" 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 any differences are detected or not, the IC Tester will indicate "GOOD" or which pins show 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 **MAN**ual mode of operation or when the **14, 16, 18,** or **20** switch is selected. Remember that when using the **MAN**ual mode of operation, the ground and VCC 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 ground, VCC, 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 were malfunctioning.

IC CLIPS

Some products that use TTL 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-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).

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).

CIRCUIT DESCRIPTION

Refer To Seperately Supplied Schematic Diagram

The Model 550 IC Tester consists of 20 identical circuit blocks, 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. To make this circuit description less complicated, reference will only be made to one individual block. Each block 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. The signal from the IC clip is inverted by IC_C and fed to the cathode of D_A. The anode of D_A is tied to VCC through D204 and D205.

When a low logic signal is present at the IC Clip, the signal is inverted by IC_C. The resulting high signal is fed to the cathode of D_A which does not light because a high logic (VCC) signal 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) and fed to the cathode ot 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, the inverter 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, transistor Q205 is turned on and current flows through D21 (the **GOOD** LED), R223, and D203 to ground. This causes the **GOOD** LED (D21) to also 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 disables the inverters. When the inverters are disabled their outputs are in a high impedance state and are essentially not in the circuit.

The IC pin number selector switches (at the bottom of the IC Tester) select the ground and VCC pins by directly connecting the ground pin of the reference IC to the ground pin of the IC under test and the VCC pin of the reference IC to the VCC 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 ground pin of the reference IC to the ground pin of the IC under test and the VCC pin of the reference IC to the VCC 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). The output of the exclusive NOR gates are fed to a SET-RESET flip-flop (IC_B) whose output is fed through D_B to the cathode of an LED (D_A). As previously stated, the anode of the LED (D_A) is tied to VCC through R_B, D204, and D205. Pressing the **TEST** button, sets the flip-flop, 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). 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 Q207 turns off. When Q207 is turned off, Q206 is turned on. This connects the cathode of D21 to ground through Q206 and R224. Because at least one of the IC under test's pins must be at ground, the H line is tied to ground through R_A. This turns on Q205, allowing current to

flow through D21 and therefore turning on D21 (the GOOD LED).

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 Q207 is turned off. Q207 (when turned off) turns on Q206, which connects the cathode of D21 to ground through R224. If any of the pins of the IC clip are connected to ground, the H line is brought low, and transistor Q205 is turned on. This allows current to flow through Q205, D21, Q206, and R224, turning on D21.

POWER SUPPLY

When +5 Volts is connected across the IC Tester's red and black test clips, transistor Q201 turns on, turning on Q202 and Q204. Transistors Q202 and Q204 are used as switches and when they are turned on, they are essentially seen as closed switches. Capacitors C121, C201, and C202 are used as filters. As voltage across the IC Tester's test clips is increased, diode D201 (5.6 V Zener) and transistor Q203 begin to conduct and current is steered away from transistor Q201. This turns transistor Q201 off, which turns off transistors Q202 and Q204, preventing any power from reaching the IC Tester's components. When the polarity across the IC Tester's test clips is reversed, transistors Q201, Q202, and Q204 all turn off, and again power is prevented from reaching the IC Tester's components.

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. 4). 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.

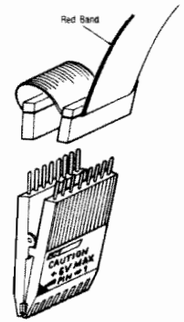


Fig. 5. Assembling The IC Clip.

WARRANTY SERVICE INSTRUCTIONS
(For U.S.A. and its Overseas Territories)

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.

LIMITED ONE-YEAR WARRANTY

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.

NOTES

(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 (cardiopulmonary resuscitation) first aid is highly recommended.

B+K PRECISION DYNASCAN CORPORATION
6460 West Cortland Street
Chicago, Illinois 60635

SCHEMATIC DIAGRAMS AND PARTS LIST

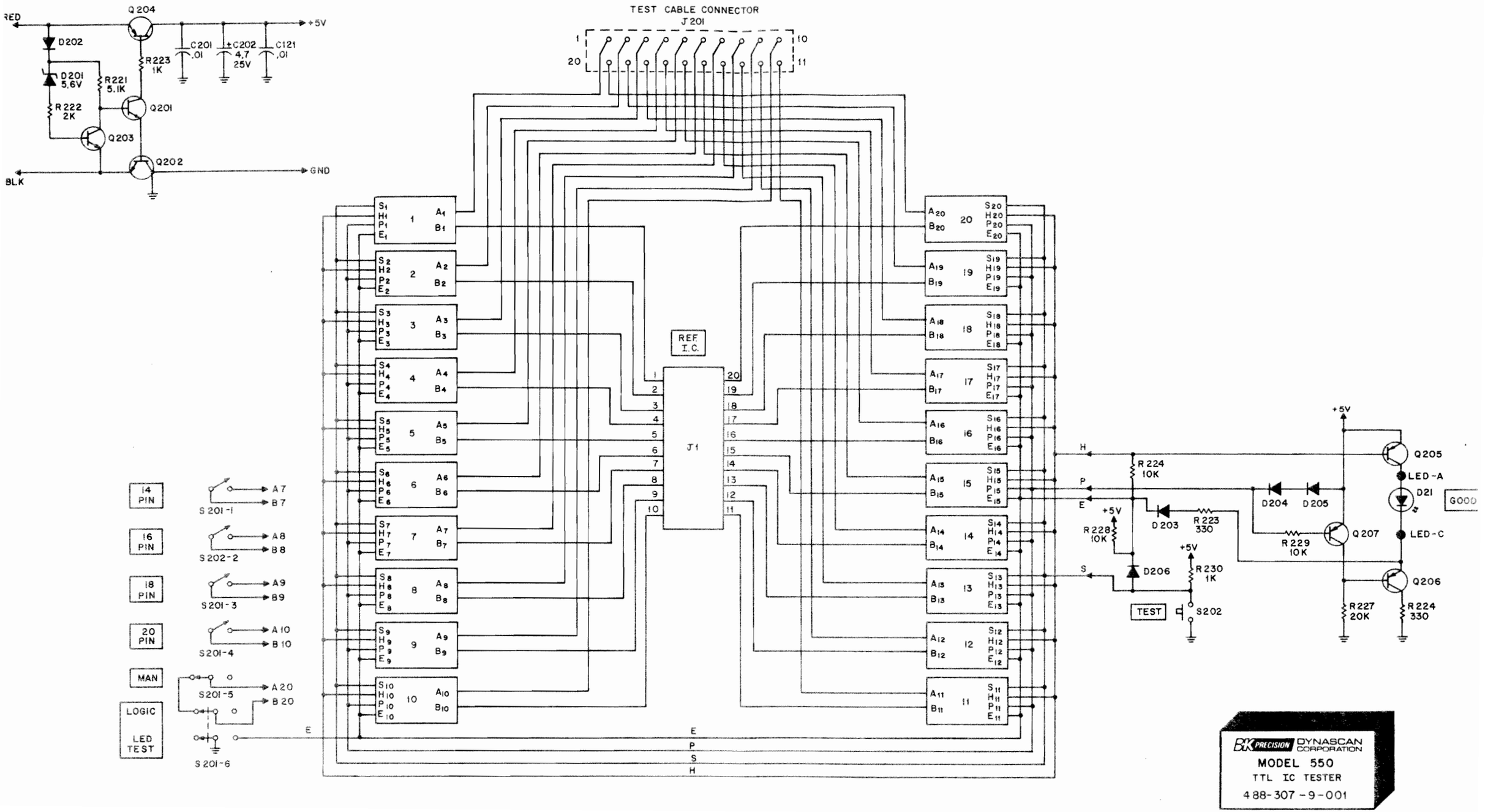
B+K PRECISION 550

TTL IC TESTER

PARTS LIST
488-307-9-003

SCHEMATIC SYMBOL	DESCRIPTION	DYNASCAN PART NO.
	RESISTORS	
	Unlisted resitors are ±5%, 1/4 W. See schematic diagram for value.	
R1 - 20	1 kΩ ±5%, 1/8 W, Deposited Carbon	002-108-8-102
R21 - 40	560 kΩ ±5%, 1/8 W, Deposited Carbon	002-108-8-561
	CAPACITORS	
C101 - 120	680 pF ±20%, 100 V, Ceramic Disc	020-372-9-001
C121, 201	0.01 µF +80/-20%, 50 V, Monolithic Ceramic	020-260-9-001
C202	4.7 µF ±20%, 25 V, Low Leakage Electrolytic	036-005-9-008
	DIODES	
D1 - 21	LED (Hi-Efficiency), Red	158-040-9-001
D101 - 120	1N4148, Silicon	151-038-9-001
D201	1N4734A, 5.6 V ±5%, 1 W, Zener	152-036-9-001
D202 - 206	1N4148, Silicon	151-038-9-001
	TRANSISTORS	
Q201 - 203	MPS6515 NPN, Silicon	176-050-9-001
Q204 - 207	MPS6519 PNP, Silicon	177-015-9-001
	INTEGRATED CIRCUITS	
IC101 - 105	74HC266	308-346-9-001
IC106 -110	74LS279	307-395-9-001
IC201 - 203	74HCT240	308-347-9-001

COMPOSITE
499-326-9-001


RED
Q204
+5V
D202
C201 .01
+C202 4.7 25V
C121 .01
R223 1K
D201 5.6V
R221 5.1K
R222 2K
Q201
Q203
Q202
BLK
GND
TEST CABLE CONNECTOR
J201
1
20
10
11
REF I.C.
J1
14 PIN
16 PIN
18 PIN
20 PIN
MAN
LOGIC LED TEST
S201-1
S202-2
S201-3
S201-4
S201-5
S201-6
A7
B7
A8
B8
A9
B9
A10
B10
A20
B20
E
P
S
H
+5V
R224 10K
R228 10K
D203
R223 330
D206
R230 1K
TEST
S202
D204
D205
R229 10K
Q207
Q205
LED-A
D21
LED-C
GOOD
Q206
R227 20K
R224 330
BK PRECISION DYNASCAN CORPORATION
MODEL 550
TTL IC TESTER
488-307-9-001

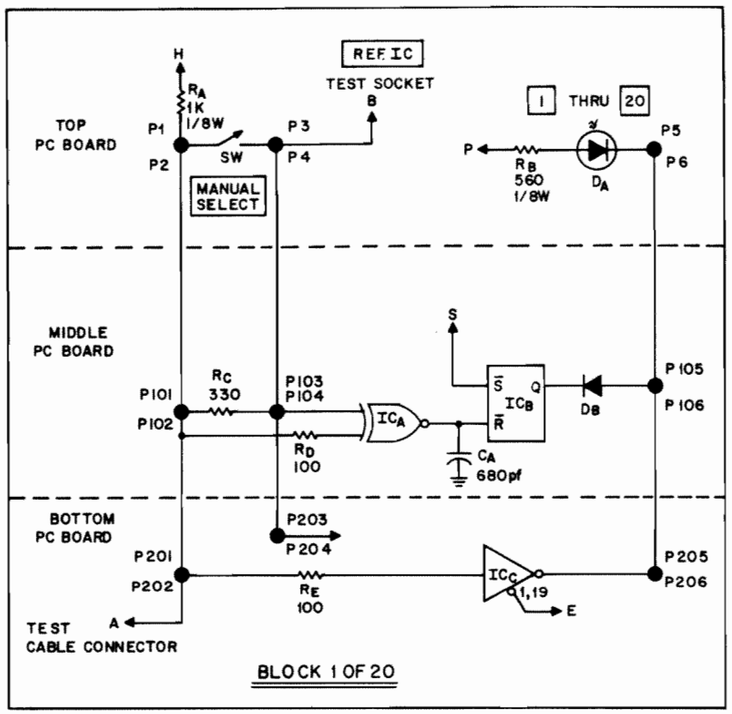
SCHEMATIC SYMBOL	DESCRIPTION	B & K-PRECISION PART NO.
	SWITCHES	
S1, 2	10 Section SPST DIP	082-013-9-001
S201	6 Station Pushbutton Assembly	088-140-9-001
S202	Momentary SPST Pushbutton	088-139-9-001
	MISCELLANEOUS	
J1	20 Pin ZIF IC Socket	762-032-9-001
J201	20 Pin Right Angle Mount Connector	770-027-9-001
	16 Pin Cable Assembly	428-083-9-001
	16 Pin IC Test Clip	523-814-9-001
	20 Pin Cable Assembly	428-084-9-001
	20 Pin IC Test Clip	523-815-9-001
	IC Test Clip Label	483-581-9-001
P1 - 6	12 Pin Male PCB Connector	757-111-9-001
P101 - 106	12 Pin Female PCB Connector	757-112-9-001
P201 - 206	12 Pin Female PCB Connector	757-112-9-001
	Red Hook Probe And Wire Assembly	522-080-9-002
	Black Hook Probe And Wire Assembly	522-080-9-010
	Pushbutton, Black	384-018-9-001
	Name Plate	260-423-9-002
	Front Panel Inlay	260-423-9-003
	Case, Top	271-318-9-001
	Case, Bottom	271-319-9-001
	Anti-Skid Pad	388-084-9-001
	#0-80 x 3/8" Phillips Flat Head Screw (For J1)	621-006-1-303
	#0-80 Hex Nut (For J1)	641-205-1-103
	#0 Flat Washer (For J1)	724-078-9-001
	#2-56 x 1/2" Phillips Pan Head Screw (For J201)	623-008-1-301
	#2-56 Hex Nut (For J201)	643-206-1-304
	#2 Flat Washer (For J201)	720-015-3-102
	#2 Lock Washer (For J201)	731-066-9-001
	#4 x 7/16 Hi/Lo Self Threading Pan Head Screw (For Case)	704-914-1-901
	Instruction Manual	480-488-9-001

PARTS ORDERING INFORMATION

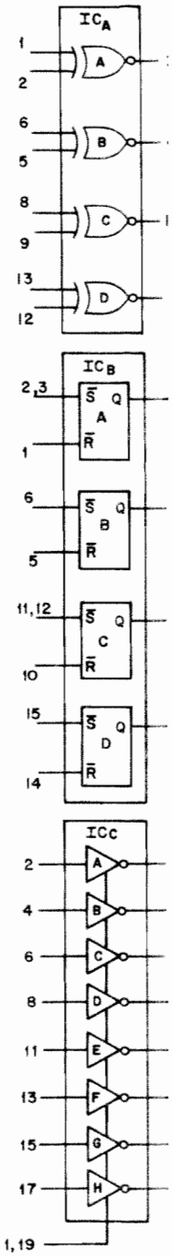
There is a minimum charge for each invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover handling, postage, or express charges. Specify model and serial number when ordering replacement parts.

ORDER REPLACEMENT PARTS FROM:

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



BLOCK	R_A	R_B	R_C	R_D	R_E	D_A	D_B	C_A	SW	IC_A	IC_B	IC_C
#1	R1	R21	R101	R121	R201	D1	D101	C101	S1-1	101-A	106-B	201-D
#2	R2	R22	R102	R122	R202	D2	D102	C102	S1-2	101-B	106-A	201-H
#3	R3	R23	R103	R123	R203	D3	D103	C103	S1-3	101-C	106-C	201-C
#4	R4	R24	R104	R124	R204	D4	D104	C104	S1-4	101-D	106-D	201-B
#5	R5	R25	R105	R125	R205	D5	D105	C105	S1-5	102-A	107-B	201-A
#6	R6	R26	R106	R126	R206	D6	D106	C106	S1-6	102-B	107-A	202-G
#7	R7	R27	R107	R127	R207	D7	D107	C107	S1-7	102-C	107-C	202-E
#8	R8	R28	R108	R128	R208	D8	D108	C108	S1-8	102-D	107-D	202-H
#9	R9	R29	R109	R129	R209	D9	D109	C109	S1-9	103-A	108-B	202-D
#10	R10	R30	R110	R130	R210	D10	D110	C110	S1-10	103-B	108-A	202-C
#11	R11	R31	R111	R131	R211	D11	D111	C111	S2-11	103-C	108-C	202-B
#12	R12	R32	R112	R132	R212	D12	D112	C112	S2-12	103-D	108-D	202-A
#13	R13	R33	R113	R133	R213	D13	D113	C113	S2-13	104-A	109-B	203-D
#14	R14	R34	R114	R134	R214	D14	D114	C114	S2-14	104-B	109-A	203-C
#15	R15	R35	R115	R135	R215	D15	D115	C115	S2-15	104-C	109-C	203-B
#16	R16	R36	R116	R136	R216	D16	D116	C116	S2-16	104-D	109-D	203-A
#17	R17	R37	R117	R137	R217	D17	D117	C117	S2-17	105-A	110-B	203-H
#18	R18	R38	R118	R138	R218	D18	D118	C118	S2-18	105-B	110-A	203-G
#19	R19	R39	R119	R139	R219	D19	D119	C119	S2-19	105-C	110-C	203-F
#20	R20	R40	R120	R140	R220	D20	D120	C120	S2-20	105-D	110-D	203-E



CONNECTIONS NOT SHOWN:

IC_A (74HC266) +5V PIN 14, GND PIN 7
IC_B (74LS279) +5V PIN 16, GND PIN 8
IC_C (74HTC240) +5V PIN 20, GND PIN 10

IC-301 PINS 11, 13, 15 GND
IC-302 PIN 13 GND

B&K PRECISION DYNASCAN CORPORATION
MODEL 550
T.T.L. I.C. TESTER
488-307-9-002

SYMBOLS USED	SYMBOLS NOT USED
R1-40, 101-140, 201-230	
C101-121, 201-202	
D1-21, 101-120, 201-206	
Q201-207	
IC101-110, 201-203	
S1-2, 201-202	
J1, 201	
P1-6, 101-106, 201-206	

NOTES: (UNLESS OTHERWISE NOTED)

B. 1. ALL RESISTORS ARE IN (Ω) OHMS.
2. ALL RESISTORS ARE 1/4W, 5%, DEPOSITED CARBON.
3. ALL CAPACITORS ARE IN (μf) MICROFARADS.
4. TITLES IN RECTANGLES IS PANEL NOMENCLATURE.
5. THIS SCHEMATIC SUBJECT TO CHANGE WITHOUT NOTICE.