TRAINING EQUIPMENT FAMILIARIZATION

OBJECTIVES

Upon completion of this lesson, the student should be able to:

1. Identify the main features and the purpose of the Nida Series 130E Training Equipment.
2. Locate and describe functions of controls, indicators, and connectors on the Nida Model 130E Test Console.
3. Prepare the Nida Model 130E Test Console for an experiment by following the steps in the Prestart Checklist.
4. Describe a typical Nida Series 130 Experiment Card.
5. Install and remove a Nida Series 130 Experiment Card correctly.
6. Perform a basic experiment, using Nida Series 130E Training Equipment.

OVERVIEW

This lesson introduces students to the Nida Series 130E Electronics Training System.

The lesson identifies and explains the main features and the purpose of the Nida Series 130E Training Equipment. With the test console in front of them, students learn about the controls, indicators, and connectors. As they read, they move, pull, push, turn, or rotate all the controls. This first hands-on experience with the test console teaches them the locations and functions of test console controls.

Students then learn the procedure for preparing the test console for experiments. With a typical Series 130 Experiment Card in hand, they learn what experiment cards are, what they do, how to take care of them, and how to use them correctly. Instructors check that students can install and remove a card correctly.

Using the test console and an experiment card, students perform a basic electronics experiment. The experiment procedure emphasizes the use of good personal and laboratory safety habits. From student performance, instructors can evaluate how well the students follow experiment procedures and observe safety precautions.

PREREQUISITES

None

EQUIPMENT REQUIRED

Nida Model 130E Test Console
Nida Series 130 Experiment Card
PC130-2
INTRODUCTION

This basic electronics course is part of the Nida Series 130E Electronics Training System. The Nida system is a complete training system, designed to simplify the process of learning electronics fundamentals and developing troubleshooting skills.

The training system revolves around the Nida Series 130E Training Equipment. At the heart of this training equipment are the Nida Model 130E Test Console and the Nida Series 130 Experiment Cards. Electronic test equipment and Nida course lessons round out the training system. See Figure 1.

![Figure 1. Nida Series 130E Training System](image)

You're probably wondering why you need to use special training equipment to learn electronics. Why can’t you just use standard commercial devices like radios, TVs, and computers? Wouldn’t they be easier to use and more realistic? No way. The purpose of commercial devices such as these is to perform, not to teach.

The purpose of Nida Series 130E Training Equipment, on the other hand, is to teach rather than to perform. Nida designed the Model 130E Test Console and the Series 130 Experiment Cards specifically to provide students with:

- Effective, enjoyable electronics training.
- The widest possible range of learning experiences.
- Extensive hands-on practice with real circuits and equipment.

You will perform all experiments during your electronics training on the Nida Model 130E Test Console. The test console gives you hands-on practice working on real circuits. This increases your understanding of the circuits. In addition, you use real test instruments for testing and checking the circuits you work with. This helps you develop strong troubleshooting skills and prepares you for the future, when you enter the job market.
Among its many features, the test console contains one that is unique: the ability to insert faults into any circuit. Both you and your instructor can insert faults into any circuit simply by entering a four digit number on a keypad. Thus, you have the advantage of studying both normal and faulted circuits. No commercial radio, TV, or computer can provide you with intentionally faulted circuits to study.

You’ll use many different plug-in printed circuit (PC) experiment cards for these experiments. Experiment cards contain circuits ranging from the most basic to very complex, such as complete radio receiver circuits. With the cards, you have access to all the electronic circuits used today. Your learning experiences, therefore, will cover a very wide range.

Add up all these features of the Nida Series 130E Training Equipment. What do you come up with? There’s really only one conclusion you can make. When you use the Nida Training Equipment, you get the very best hands-on electronics training available today.

**NIDA SERIES 130E TRAINING EQUIPMENT**

The Nida Series 130E Training Equipment you will use consists of the:

- Nida Model 130E Test Console
- Nida Series 130 Experiment Cards

**NIDA MODEL 130E TEST CONSOLE**

The test console provides all the power supplies, controls, indicators, and connectors to energize the electronic circuits you will learn. With the test console, you can produce any circuit or experiment you need to complete your electronics training. In other words, the test console is a complete electronics trainer. See the drawing of the test console in Figure 2.

**NOTE:**

You should have the Model 130E Test Console in front of you while you read this section.

Refer to the drawing in Figure 2 if the test console is not available at this time.

Take a minute to look at the test console’s front panel configuration. These are the controls you will use to perform the experiments. With them, you will select power supplies, determine voltages, take readings, and control the experiments. They look pretty confusing, don’t they? Don’t worry. By the time you complete this lesson, you’ll know the locations and functions of all of them.
Examine the 47 membrane-switch keyboard. This is where you or your instructor can enter faults into any normal circuit. Your instructor can select a specific fault for a particular circuit whenever he wants to. This capability is what provides you with such complete, effective, hands-on troubleshooting training. The keyboard also allows you to select various options for the display and address trainers when in CMI or CAI modes of operation.

**SERIES 130 EXPERIMENT CARDS**

An experiment card is simply a printed circuit (PC) card. The Series 130 Experiment Cards contain all the experiments and circuits you will need to complete your electronics training. Experiment cards are easy to use. All you do is plug them into the test console.

**NOTE:**

You should have experiment card PC130-2 in front of you while you read this section.

Refer to the drawing in Figure 3 if PC130-2 is not available at this time.
Pick up your experiment card and look at it. This card is PC130-2. It has a lot of parts on it, doesn’t it? These parts are real electronic components which you can see, touch, and test.

Different experiments and circuits require different electronic components, so no two cards are alike. Look again at PC130-2 and the components on the card. You’ll find PC cards very much like this one in all commercial electronic devices.

Having your experiments and circuits preassembled on the Series 130 Experiment Cards:

- Reduces set-up and take-down time for experiments.
- Eliminates the risk of losing small electronic parts.
- Minimizes experiment errors caused by incorrect wire connections.

**SAFETY FEATURES**

The Series 130E Training Equipment contains several safety features. The test console has built-in safety circuits. These safety circuits automatically limit the power that you can apply to your experiments. They protect both the equipment and you in case you accidentally make a potentially dangerous, incorrect switch setting.

No piece of equipment, however, can contain enough safety features to guarantee your safety. You must help, too, by learning all you can about your equipment. That's why this lesson is so important.

**TEST CONSOLE CONTROLS, INDICATORS, AND CONNECTORS**

What is the first thing you would do if you were to buy a new tape recorder? You’d read the owner’s manual to learn where all the controls are and what each one does. Until you used all the controls, you might not fully understand what some of them do. However, this wouldn’t bother you since you would learn what they all do eventually.

Learning to operate the Nida Model 130E Test Console is no different than learning to run a new tape recorder. You need to locate all the controls, indicators, and connectors and learn what they do. Then you can operate the test console. Since you’ll use the test console throughout your electronics training, you must learn to operate it correctly.
You’ve probably already noticed that the test console has a lot of controls. The 130E Trainer has two control panels: front and rear. To make them easier to learn, let’s split the front panel controls into two groups, according to their function. We do this simply by dividing the front of the console into two separate control panels.

The drawing of the test console in Figure 4 illustrates these two control panels. Now compare the drawing with the Model 130E Console itself.

![Figure 4. Two Control Panels, Nida Model 130E Test Console](image)

Notice that each control panel in Figure 4 has a name. The name identifies the test console functions controlled by the panel, which helps you identify and locate the controls.

**DC POWER AND CONTROL PANEL**

What kind of controls does the DC Power and Control Panel contain? That’s an easy question to answer. It contains the controls and indicators that control and monitor test console power supplies, fault insertion and removal, diagnostics, and the console’s display. The panel also contains some controls with other functions, but most of the controls are for power control and monitoring.

**CAUTION**

CHECK TO BE SURE THAT TEST CONSOLE POWER CORD IS UNPLUGGED BEFORE CONTINUING.

Remember: CAUTIONS contain information regarding any situation which can cause damage to your equipment.
**CONSOLE POWER Switch**

The CONSOLE POWER switch turns test console power ON and OFF. You’ll find this rocker switch on the upper left corner of the Rear Panel.

Look at the drawing of the POWER switch in Figure 5. Now locate the switch on the Test Console. The POWER switch is a rocker action push ON/push OFF switch. Pressing on the top portion of the switch applies power to the test console. Pressing on the bottom portion of the switch removes power from the test console.

**CONSOLE CONTROLS Section**

The CONSOLE CONTROL Section contains a display, two individual DC power supply control sections and a keyboard. Refer to Figure 6.
DISPLAY

The DISPLAY is a four x twenty back-lit liquid crystal display. It is used to monitor data, input or output. Upon power up, the display will show the trainer running a short diagnostic routine. When the routine is completed, it will then display the mode of operation the trainer was in when it was last used.

![Manual Mode](image)

Figure 7. Display

KEYBOARD

The KEYBOARD contains 47 switches that are used to enter data into the microprocessor. Any typed characters, numbers or symbols are subsequently shown on the test console display.

![KEYBOARD AND DISPLAY](image)

Figure 8. Keyboard

The 47 switches, when pressed, place a particular character number or symbol onto the DISPLAY’s command line. When the command is typed and the ENTER key is pressed, the microprocessor performs the ordered activity.
SHIFT/CLEAR keys

These keys are used to clear the display of entered data. Pressing SHIFT/CLEAR will also remove any faults that have been entered into the trainer.

Refer to Figure 8 and locate the two keys on the test console.

ENTER key

When the ENTER key is depressed, any command that has been typed in on the display’s command line is sent to the test console’s microprocessor. The types of commands available are:

* FAULT INSERTION
* CLEARING INDIVIDUAL OR MULTIPLE FAULTS
* DISPLAYING FAULTS
* DIAGNOSTICS
* TEST CONSOLE DISPLAY SETTINGS
* TRAINER ADDRESSING FOR COMMUNICATIONS

Using the test console’s keyboard is just like using a computer or typewriter keyboard. The operation is as follows:

1. Press the SHIFT/CLEAR keys. Before entering any data into the test console, always CLEAR the console. This ensures that you start under known parameters.

2. Press the key on the keyboard that represents the first number or letter you wish to enter. For example, if you wish to enter 123, press the 1 key first. The DISPLAY will indicate "1".

3. Now, press the "2" key on the keyboard. The DISPLAY will indicate "12".

4. Finish the sequence by pressing the "3" key on the keyboard. The DISPLAY will indicate "123".

5. Press the ENTER key. This sends the typed characters shown on the DISPLAY to the test console’s microprocessor as a command. The microprocessor will interpret the numbers and letters and perform the desired function. The example "123" is not a actual command and, when entered, will cause the microprocessor to send a message to the display that says: "Bad Command".

You will enter data into the test console during experiments not controlled by a computer. During computer assisted instruction, the keyboard is disabled and control of the test console is maintained by the computer.
**Exercise 1: Test Console Controls, Indicators, and Connectors.**

Match the control, indicator, or connector in column 1 with its correct function from column 2. Then place the letter from the column 2 function in the correct blank in column 1. Check your answers and review any weak areas you might have.

<table>
<thead>
<tr>
<th>COLUMN 1</th>
<th>COLUMN 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CONSOLE POWER Switch</td>
<td>A. Resets DISPLAY to default settings and clears any set faults.</td>
</tr>
<tr>
<td>2. SHIFT/CONSOLE POWER Switch</td>
<td>B. Sends commands to the microprocessor.</td>
</tr>
<tr>
<td>3. DISPLAY</td>
<td>C. Sets an initial control setting.</td>
</tr>
<tr>
<td>4. SHIFT/CLEAR Keys</td>
<td>D. Turns power ON to the test console.</td>
</tr>
<tr>
<td>5. ENTER Key</td>
<td>E. Sends commands, shown on the DISPLAY, to the microprocessor.</td>
</tr>
<tr>
<td>6. KEYBOARD</td>
<td>F. Indicates trainer status</td>
</tr>
</tbody>
</table>

**INSERTING, CLEARING and DISPLAYING FAULTS**

At times, during experiments, you will be instructed by the lesson material to enter a command into the trainer. For example, suppose the lesson instructs you to insert faults F102 and F106. Simply key in "F102" followed by pressing ENTER, and then repeat the process for "F106". The Nida Model 130E Test Console is capable of storing multiple faults in all three experiment card positions.

Clearing (erasing) faults is accomplished much the same way. It should be mentioned that faults can be cleared individually, by PC position or collectively.

Clearing an individual fault can be accomplished by either using "C" or "E" followed by the three digit numerical code. For example: C110 or E110. Both commands will instruct the microprocessor to remove fault 10 from PC position 1.

Clearing multiple faults for a particular PC position is performed by using "C" followed by the numerical code "100" for PC1, "200" for PC2 or "300" for PC3. For example: To clear all faults in PC2, type C200 and then press ENTER.

Clear ALL faults in ALL PC positions by either typing the code: "C000" and pressing ENTER or pressing SHIFT/CLEAR.

When it is desired to view what faults are already inserted or to verify faults you have just inserted or erased, simply type DF (display faults) at the command line and press enter. The command prompt will change from "COMMAND>_" to "FAULT:.". Following the : (colon), the first stored fault will be displayed. For example, if PC position 1 had fault 11 inserted, when the "DF" command was asserted, the display would show: FAULT: F111 _.
If more than one fault has been inserted, it is necessary to press ENTER again in order to display it. The continued pressing of ENTER will show all faults for all PC positions. After all inserted faults have been displayed, the command line will appear as "FAULT: Fxxx END_. If the trainer had no set faults, the command line would read "FAULT: 0 END_.

**DC POWER SUPPLIES Section**

The DC POWER SUPPLY section contains a Voltmeter (as a part of the display), Positive and Negative Supply controls, and four output connectors. Refer to Figure 9.

**NOTE:**

DC is the abbreviation for Direct Current. DC power is the type of power a battery produces.

The Model 130E Test Console contains two user DC power supplies: Positive and Negative. There is also a system DC supply that provides DC voltages used to operate the test console. AC (alternating current) wall outlet power is connected to the rear of the test console. This power is applied to a series of transformers and rectifiers to produce the DC voltages needed for the user positive and negative supplies as well as those used to operate the test console itself.

**DC Power Supply Controls**

On the left side of the keyboard are the controls and connectors for the negative power supply. There are two membrane switches: one marked with an up arrow and one with a down arrow. By pressing the arrows you can select one of four DC voltages: 5, 12, 15 and 24 VDC. There are four red LED’s to the right of the selector switches, one for each of the four available DC voltages. When you have selected, for example, 5 VDC, the LED adjacent to the 5 will illuminate.
The positive supply is located on the right hand side of the keyboard. Voltages are selected in exactly the same manner.

In addition to the LED indicators, the console’s display will indicate the exact voltage (positive or negative) to either a tenth or one hundredth of a volt. See Figure 7.

**Output Connectors**

Each DC power supply contains two OUTPUT connectors. These connectors provide access to the output of each DC power supply. You’ll find a pair of OUTPUT connectors below each SUPPLY control. Refer to Figure 9 and locate the connectors on the test console.

The OUTPUT connectors are "tip connectors". They allow certain types of cables, normally from an external piece of equipment, to be inserted. You will use these connectors in Block 2 when you study multimeters. Also notice that two of the connectors are black; these are referred to as ground or common connectors. One connector is red; this is the voltage output of the POSITIVE voltage supply. The last connector is green; it is the output of the NEGATIVE voltage supply.

You have covered all the control, indicators, and connectors that are on the DC POWER and CONTROL Panel. Let’s try one more exercise to test your retention of the material.

**Exercise 2:  Control, Indicators, and Connectors.**

Match the command in Column 1 with its correct function from Column 2. Then place the letter from the Column 2 function in the correct blank in Column 1. Check your answers and review any weak areas you might have.

<table>
<thead>
<tr>
<th>COLUMN 1</th>
<th>COLUMN 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ 1. F204</td>
<td>A. Clears all faults in PC position 1.</td>
</tr>
<tr>
<td>___ 2. F100</td>
<td>B. Clears fault 03 from PC position 2.</td>
</tr>
<tr>
<td>___ 3. C100</td>
<td>C. Clears all faults in PC position 3.</td>
</tr>
<tr>
<td>___ 4. E203</td>
<td>D. Clears all faults in all PC positions.</td>
</tr>
<tr>
<td>___ 5. DF</td>
<td>E. Displays all inserted faults.</td>
</tr>
<tr>
<td>___ 6. C000</td>
<td>F. Inserts fault 00 in PC position 1.</td>
</tr>
<tr>
<td>___ 7. C300</td>
<td>A. Inserts fault 04 in PC position 2.</td>
</tr>
</tbody>
</table>
EXPERIMENT CARD CONNECTOR PANEL

The Experiment Card Connector Panel contains PC card connectors and power supply controls for the experiment cards. The panel also contains connectors to provide access to outputs from the experiment cards.

PC Card Connectors

The panel has three sets of PC card connectors. Thus, you can mount up to three experiment cards at the same time on the test console.

The connectors provide the circuit connections between the installed Series 130 experiment cards and the test console. Look at the drawing in Figure 10. Now locate the PC card connectors on the test console. Notice the PC1, PC2, and PC3 labels on each set of PC card connectors. These labels identify the test console PC card positions.

The connector plugs, or pins, plug into corresponding receptacles on the experiment cards. A connector, therefore, consists of two parts: the pins and the receptacle.

The connector pins are the male part of the connectors. The receptacles are the female part of the connectors. This use of the words male and female for the two parts of a connector is fairly common.

Look again at the drawing in Figure 10 and at the PC positions on the test console. Notice the arrangement of the pins.

The pins in each set of connectors form an upside down U. Each U consists of four groups of six pins, for a total of 24 pins per PC position.
DC POWER Switch

Each PC position has a DC POWER switch. These switches control the application of DC power to the experiment cards at PC1, PC2, and PC3. You'll find the switches at the top right hand center of each PC position.

Look at the drawing of the PC1 DC POWER switch in Figure 11. Now locate the PC1, PC2, and PC3 DC POWER switches on the test console.

These switches are membrane switches, just like the FILAMENT switch. You turn the switch ON by pressing once; the inductor illuminates. You turn the switch OFF by pressing again; the inductor goes out. Also, pressing the SHIFT/CLEAR switch turns the switch OFF. When you turn a PC POWER ON/OFF switch ON, you apply power to specific male connector pins at that PC position.

How you set the POSITIVE and NEGATIVE SUPPLY controls determines which power you apply to the pins. When you turn a PC DC POWER switch OFF, you turn off the power to the PC position.

PC AC Switch

PC positions 1 and 2 have an AC switch. These switches control the application of AC power to the pins. You’ll find the PC AC switches just to the left of the PC DC POWER switches.

Look at the AC switch in the drawing of Figure 12. Now locate the PC1 and PC2 AC switches on the test console.

You will learn about AC power in Unit II. The AC switches also have an indicator lamp that tells you when they are ON. Again, pressing the SHIFT/CLEAR switches turns the AC switches OFF.

SPEAKER Switch

The SPEAKER switch turns the test console speaker ON and OFF. You’ll find this switch on the PC3 position to the left of the PC3 DC POWER switch. The SPEAKER itself is located on the inside of the test console.

Look at the SPEAKER switch in the drawing in Figure 13. Locate the switch on the test console. This switch is a membrane switch with an indicator lamp. Pressing the SHIFT/CLEAR switch turns this switch OFF.
**PC INPUT Connector**

PC position 1, PC1, has an INPUT connector. External equipment plugs into this connector. Look at Figure 14 and locate the INPUT connector on the test console.

The INPUT connector is a bayonet (BNC) connector. It is the receptacle half of a plug-and-receptacle connector. A plug-and-receptacle connector is common in your home. The plug on your TV power cord and a wall outlet is an example of a plug-and-receptacle connector.

Look again at the connector and notice its construction. BNC connectors provide safe, easy, and secure connections for external equipment.

**PC OUTPUT Connectors**

Each PC position has an output connector. These connectors provide access to output signals from the experiment cards. You’ll find the PC OUTPUT connectors just to the right of the PC DC POWER switches at each PC position.

Look at the PC1 output connector in the drawing of Figure 15. Now locate the PC1, PC2, and PC3 OUTPUT connectors on the test console.

The PC OUTPUT connectors are BNC connectors. They are the receptacle or the female part of the connector. PC OUTPUT connectors look and operate just like the PC1 INPUT connector.
Onboard Volt/Current Meter

On the right side of the rear panel (as you are facing it) are two BNC connectors marked as "Ext. Inputs". These are further marked as "I" and "V" just above the connectors. By connecting BNC to Alligator cables to these inputs, the onboard meter can be used.

In order to place the 130E Test Console in the "Meter Mode", you must press "SHIFT/5". Once this has been done the console’s display will appear as:

**Meter Mode**

```
Command > _  

AC VOLTS  
00.0 V
```

Figure 16. EXT. INPUTS

Figure 17. Console Display
The 130E’s meter functions include:

* AC Volts
* DC Volts
* DC Current

To change the meter function from AC volts to DC volts, press “SHIFT/5” again. Repeat that process to change the meter to DC Current. Pressing “SHIFT/5” one more time will take you back to the command prompt with the console in the Manual Mode.

**KEYBOARD CONTROLLED SYSTEM FUNCTIONS**

Upon power up, the NIDA 130E Test Console is programmed to default to nominal settings. However, these can be tailored to your needs, likes or dislikes. The settings listed below are shown in their default state and are activated or de-activated through the use of keyboard commands. The keyboard commands needed to turn on or off a particular function are also listed.

<table>
<thead>
<tr>
<th>FUNCTION/DEFAULT CONDITION</th>
<th>KEYBOARD COMMAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Display Voltage - ON</td>
<td>SHIFT/1</td>
</tr>
<tr>
<td>2. System Warning - ON</td>
<td>SHIFT/2</td>
</tr>
<tr>
<td>3. Sound - ON</td>
<td>SHIFT/3</td>
</tr>
<tr>
<td>4. Blinking Cursor - OFF</td>
<td>SHIFT/4</td>
</tr>
<tr>
<td>5. On-board DVM - OFF</td>
<td>SHIFT/5</td>
</tr>
<tr>
<td>6. Voltage Display to 1/10th volt - ON</td>
<td>SHIFT/6</td>
</tr>
</tbody>
</table>

If the default settings are altered, any time the console’s power is recycled, the settings return to their default state.

**Exercise 3: Experiment Card Connector Panel.**

Answer the following questions about the controls and connectors on the Experiment Card Connector Panel. Write the correct letter for each answer in the blank provided.

1. PC card connectors ____________.

   a. provide input signals to the experiment cards from the INPUT BNC
   b. provide AC and DC power connections from the test console
   c. provide circuit connections between the experiment cards and the test console
   d. do all of the above
2. PC DC POWER switches control the application of ____________ .
   a. positive DC power only
   b. Negative DC power only
   c. all DC power
   d. AC power

3. PC AC switches control the application of ____________ .
   a. AC to the Test Console
   b. AC power to all PC positions
   c. AC power to PC1 and PC2 only
   d. DC and AC power to PC1 and PC2

4. PC OUTPUT connectors ____________ .
   a. Monitor PC circuit power
   b. provide access to output signals from PC positions
   c. connect experiment outputs to speaker
   d. connect AC or DC power output to other devices

5. The SPEAKER switch is located in which PC position?
   a. PC1
   b. PC2
   c. PC3
   d. PC4

6. The INPUT connector is located in which PC position?
   a. PC1
   b. PC2
   c. PC3
   d. PC4

**PREPARING THE TEST CONSOLE FOR USE**

Preparing the test console for an use is much like getting your car ready for a long trip. You must check out the test console. You need to know that it is in good condition so you won't have problems with your experiments.

The easiest way to prepare your test console is to establish a known starting point. Learn how to reach this starting point before you start an experiment. Develop the habit of being at this starting point before turning your test console ON.
PRESTART PROCEDURE, NIDA MODEL 130E TEST CONSOLE

Complete both parts of the checklist before operating the test console.

WARNING

THE TEST CONSOLE MUST NOT BE PLUGGED IN AND THE POWER SWITCH MUST BE OFF DURING THE PRESTART PROCEDURE.

Visual Inspection of Test Console

Inspect the test console thoroughly. Look for any physical damage to the circuit card connectors, membrane switches, BNC connectors, the RJ11 communication ports, fuse housings (including the power module), and the power transistors, Q1 and Q2, on the back of the console. Also, check the chassis for any dents or scratches severe enough to indicate that there may be internal damage.

Check the power cord and plug. Inspect for chipped, cracked or cut insulation, or any other damage that would render the power cord and plug unserviceable.

If you find any defects during your visual inspection of the test console, DO NOT proceed any further until your instructor has been notified.

Initial Control Settings, Nida Model 130E Test Console

For the Nida 130E Test Console, the initial control settings consist of nothing more than applying power to the unit. The console's display should illuminate, but no other LED indicators should be active. This means that the positive and negative power supplies should be OFF and the illuminating switches on the PC positions (AC, DC, and Speaker) should be OFF.

NIDA SERIES 130 EXPERIMENT CARDS

You've already learned a little bit about the experiment cards. You have also learned where to mount the cards on the test console. The next step is to learn more about the cards themselves.
EXPERIMENT CARD IDENTIFICATION

All Nida Series Experiment Cards have numerical identifiers assigned to and printed on them. Refer to Figure 18. With the exception of a few specialized cards, all of the experiment cards have this number in the upper right hand corner.

NOTE: Some Nida Series 130 Experiment Cards that are closely related will have a letter following the numerical identifier, normally either "A" or "B".

Notice the words NIDA Corp. and the Nida logo in the lower left corner of the card.

All Series 130 Experiment Cards display the Nida name and logo. The exact location on the card may vary based upon available space due component placement for circuit requirements.

Pick up your experiment card and hold it so the white letters spelling NIDA Corp. are right side up. Now you're holding the card correctly.

This card is the Nida Series 130 Experiment Card PC130-2.

EXPERIMENT CARD CONSTRUCTION

Experiment cards are made of G-10 glass epoxy. You probably know glass epoxy under its more common name, fiberglass. Look at PC130-2. It's not very big: 4 inches by 5 inches. The fiberglass, however, is fairly thick: 1/16 of an inch.

The small size coupled with the thickness of the fiberglass means that the card is very strong and durable. This helps prevent the cards from breaking or bending when you handle them. The cards also must be strong and durable to provide a good foundation on which to mount components and receptacles.

EXPERIMENT CARD RECEPTACLES

You've learned that the three sets of 24 PC card connector pins on the test console are the male half of the connector. Now you'll learn about the female half of the PC card connectors: the experiment card receptacles.
Look at the drawing in Figure 19. The drawing shows a side view of both halves of a PC card connector.

Compare the drawing in Figure 19 with your experiment card. See the holes on three sides of the card? The holes form a U, just like the PC card connector pins.

Now look at the round metal cylinders that stick up from the card, blocking some of the holes. If you look closely, you'll see three cutouts in the wall of each cylinder. The cutouts extend up like fingers toward the center of the cylinder. These fingers are the experiment card receptacles.

When you install an experiment card on the test console, the receptacle fingers grip the PC card connector pins tightly. Because of their tight grip, these fingers:

- Clean the pin surfaces as they slide in place over the pins.
- Guarantee a good electrical connection with the pins.

The number of receptacles on the experiment cards varies, depending on what circuits and experiments the cards contain. Count the number of receptacles on PC130-2. How many are there? If you don't count nine, you'd better do it again.

You learned to identify the test console pins by their labeled letters. You also have to learn to identify the receptacles. As you can see, however, the receptacles have no numbers or letters to identify them.

How, then, do you identify the receptacles? It’s really very easy. Remember that the receptacles form a U just like the pins do on the test console. You simply identify each receptacle by the letter of its corresponding pin on the test console.

**COMPONENT MOUNTING**

Look at the front of PC130-2. The front is the component side, or the top side, of all experiment cards. That’s because this side of the card:

- Contains all the components.
- Always faces up toward you when it is on the test console.

PC130-2 contains three different components on the front: receptacles, resistors, and test terminals. The components are mounted through holes drilled in the cards and then secured with solder on the back of the card.
COMPONENT INTERCONNECTIONS

What connects all the components on an experiment card into a circuit? Look at the drawing of the back side of PC130-2 in Figure 20. It looks a bit like a road map. Well that is exactly what it is--an electronic road map.

The roads on the map are really the component interconnections that connect the components on our modern PC cards.

The name for these component interconnections is solder or copper lands. Copper lands replace the wires that provided the interconnections on older terminal boards. The components and lands together form the circuit on PC130-2.

Turn PC130-2 over and look at the back side. Follow the lands around the card.

Notice that one land never crosses another one. Some of the lands are even routed around others to complete the circuit without touching.

Some experiment card circuits are so complex that the lands run on both the front and the back of the PC card. This happens only when a PC card contains a lot of components.

Now look at the receptacles on the back of PC130-2. Some of them do not connect with the circuit. Their purpose is to help align and secure the experiment card on the test console pins. On every experiment card, you’ll find at least two receptacles for each group of six pins on the test console.

Exercise 4: Nida Series 130 Experiment Cards.

Answer the following questions about the Series 130 Experiment Cards. Write the correct letter(s) for each answer in the blank provided.

1. Where do you find the identification number/letter on the experiment cards?
   a. Back lower left corner
   b. Front upper left corner
   c. Back upper right corner
   d. Front upper right corner

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Exercise 4  (continued)

2. Experiment cards are made from ________________ .
   a. plastic
   b. fiberglass

3. Experiment card receptacle fingers ________________ .
   a. provide a strong grip on the test console pins
   b. make a good electrical connection with console pins
   c. clean the pins when you install a card
   d. do all of the above

4. How are components mounted on and attached to the experiment cards?
   a. With screws
   b. With solder
   c. With glue
   d. Mechanically

5. Experiment card component interconnections are ________________ .
   a. metal tape
   b. external wires
   c. internal wires
   d. solder or copper lands

TAKING CARE OF YOUR EXPERIMENT CARDS

The Series 130 Experiment Cards are strong and durable, as you learned earlier in this lesson. In spite of this, you should use experiment cards in only one way: as experiment cards on the Model 130E Test Console. No matter how strong and durable they are, any other use can easily damage or break them.

Use your common sense when handling your experiment cards. To avoid any possible abuse of your experiment cards, learn to store them correctly and safely. Ask your instructor where you should store them when you are not using them for your experiments.

EXPERIMENT CARD INSTALLATION AND REMOVAL

Now let’s put the test console and the experiment cards together. First, however, you need to learn how to install and remove them.
Installation Procedure

Because of the arrangement of the connector pins and receptacles, you can install experiment cards only one way: component side up, with the lettering and the Nida logo right side up.

The following steps show you the correct procedure for installing an experiment card on your test console PC1 position. Since all three PC positions are the same, this procedure applies to all three PC positions.

a. Perform the steps of the Prestart Checklist Visual Inspection of the Test Console.

b. Set test console controls to their Initial Control Settings, as listed in the Prestart Checklist.

c. Pick up PC130-2 with both hands, as shown in Figure 21.

![Figure 21. Installing PC130-2](image-url)
d. Align the PC130-2 receptacles with the pins on PC1.
   Be sure you keep the top edge of the experiment card parallel with pins G through R. You must also keep the two sides of the card parallel with pins A through F and S through X.

e. Using firm even pressure from both hands, gently press PC130-2 into place on test console pins.

**Removal Procedure**

The following steps show you the correct procedure for removing an experiment card from your test console PC1 position. Since all three PC positions are the same, this procedure applies to all three PC positions.

a. Set test console controls to their Initial Control Settings, as listed in the Prestart Checklist.

   **CAUTION**

   NEVER REMOVE AN EXPERIMENT CARD WITH POWER APPLIED TO THE TEST CONSOLE. CHECK TO BE SURE THAT TEST CONSOLE POWER SWITCH IS OFF.

b. Grasp PC130-2 with both hands, as illustrated in Figure 22.

c. Gently rock PC130-2 as you lift it from the PC1 position until the receptacles are clear of all test console pins. While lifting, keep the edges of PC130-2 parallel with test console pins, as described in Step c. of the Installation Procedure.
BE SURE THE EXPERIMENT CARD IS COMPLETELY CLEAR OF THE TEST CONSOLE PINS BEFORE YOU MOVE THE CARD SIDEWAYS.

d. Put PC130-2 away correctly, as directed by your instructor.

Exercise 5: Experiment Card Installation and Removal.

Under the direction of your instructor, install and remove PC130-2 from your test console. Be sure to follow the procedure steps in this lesson.

NOTE:
REMEMBER, DO NOT ATTEMPT TO INSTALL PC130-2 UNLESS YOUR INSTRUCTOR IS THERE TO CHECK YOUR PROCEDURE.

EXPERIMENT

You are now ready to perform your first electronics experiment using the Nida Model 130E Test Console and experiment card PC130-2. Even though the experiment is very basic, it will give you an idea of what your future experiments are like.

PURPOSE

Your instructor will grade you on how well you follow the procedure steps while observing good safety habits. Don’t worry if you don’t understand the electronics part of the experiment. What’s important is to follow the steps and observe good safety habits, not understand the electronics.

In the experiment, you will:

- Perform the test console Prestart Checklist procedures.
- Install PC130-2 on the test console.
- Apply different DC voltages to the test console.
- Insert and remove faults.
- Record experiment results.
- Shut down the test console.
- Remove PC130-2 from the test console.
- Put all equipment away in its assigned storage area.
PROCEDURE

1. Perform the Prestart Procedure Visual Inspection of the test console.

2. Set the test console controls to the Initial Control Settings.

3. Install PC130-2 on test console PC1 position.

4. Plug the test console power cord into a bench or wall AC outlet.

5. Apply power to the test console by pressing the Console POWER switch ON. Check that the DISPLAY indicates:

   Manual Mode
   Enter Command: ___

   NOTE:
   IN FUTURE EXPERIMENTS, YOU MAY FIND THAT THE TEST CONSOLE IS ALREADY PLUGGED IN AND POWER TURNED ON. IN THIS CASE YOU MAY TURN POWER OFF AND THEN ON AGAIN TO SET UP THE INITIAL SETTINGS. REMEMBER, THOUGH, THE POSITIVE AND NEGATIVE SUPPLY CONTROLS SHOULD BE SET TO OFF.

6. Set the test console POSITIVE SUPPLY control to 5 volts. The display’s VOLTOMETER should read 5 volts.

7. Press the test console PC1 DC POWER switch ON.
   a. Does the VOLTOMETER read 5? YES _____ NO _____
   b. Does the lamp in the switch illuminate? YES _____ NO _____

   NOTE:
   IF YOU CANNOT ANSWER YES TO 7a AND b, CALL YOUR INSTRUCTOR.

8. Set the test console POSITIVE SUPPLY control to 15 volts. The display’s VOLTOMETER should read 15 volts.

9. Set the test console controls as follows:
   PC1 DC POWER switch: OFF
   NEGATIVE SUPPLY Control: 5
   PC1 DC switch: ON
10. Using the KEYBOARD, enter F106 as follows:
   a. Depress the SHIFT/CLEAR keys
   b. Depress the F key
   c. Depress the 1 key
   d. Depress the 0 key
   e. Depress the 6 key
   f. Depress the ENTER key

   This sets fault 106.

11. Enter E106. This removes fault 106.

12. Shut down the test console by setting the test console controls as follows:

   POSITIVE and NEGATIVE SUPPLY controls: OFF
   POWER switch: OFF

13. Remove PC130-2 from the test console.

14. Unplug the test console power cord and wrap it on the back of the test console.

15. Put all equipment away in its assigned storage area.

CONCLUSIONS

You have now had a chance to use the test console. Future experiments include a paragraph on the conclusions you can draw from performing the experiment. Since the purpose of this experiment was for you to use the test console, drawing conclusions is not necessary at this time.
SUMMARY

This lesson introduced you to the Model 130E Test Console, the Series 130 Experiment cards, and a basic electronics experiment.

Here is a list of what you should have learned in this lesson. If you feel unsure about anything on this list, review that portion of the lesson before you take the test.

WHAT YOU SHOULD KNOW

1. The purpose and main features of Nida Series 130E Training Equipment.
2. The locations and functions of all test console controls, indicators, and connectors.

WHAT YOU SHOULD BE ABLE TO DO

1. The Prestart Checklist:
   ♦ How to perform the Visual Inspection.
   ♦ How to set the test console controls to their Initial Control Settings.

2. The Nida Series 130 Experiment Cards:
   ♦ Construction of the experiment cards.
   ♦ How to identify an experiment card.
   ♦ How to take care of the experiment cards.
   ♦ How to install correctly on test console.
   ♦ How to remove correctly from test console.

3. How to perform a basic electronics experiment, following step-by-step procedures and observing good safety habits.