

TEXAS INSTRUMENTS PROGRAM RECORDER



Made in Singapore


TEXAS INSTRUMENTS
INCORPORATED
Dallas Texas

1049724-1

Federal Communications Commission Requirements Concerning Radio Frequency Interference

The Texas Instruments Home Computer and peripherals generate and use radio frequency (RF) energy. *If not installed and used properly* (as outlined in the instructions provided by Texas Instruments), this equipment may cause interference to radio and television reception.

This equipment has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Sub-part J of Part 15 of FCC Rules. These rules are designed to provide reasonable protection against radio and television interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television reception (which you can determine by turning the equipment off and on), try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna (that is, the antenna for the radio or television that is "receiving" the interference).
- Change the position of the computer with respect to the radio or television equipment that is receiving interference.
- Move the computer away from the equipment that is receiving interference.
- Plug the computer into a different wall outlet so that the computer and the equipment receiving interference are on different branch circuits.

If these measures do not eliminate the interference, please consult your dealer or an experienced radio/television technician for additional suggestions. Also, the Federal Communications Commission has prepared a helpful booklet, "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from

The US Government Printing Office
Washington, D.C. 20402

Please specify Stock Number 004-000-00345-4 when ordering copies.

WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

TEXAS INSTRUMENTS HOME COMPUTER

TEXAS INSTRUMENTS PROGRAM RECORDER

Model No. PHP2700

An economical data storage and retrieval system
for your TI Home Computer.

- Operates with AC or battery power.
- May also be used as audio cassette recorder.

IMPORTANT

Record the serial number from the back of the unit and purchase date in the space below. The serial number is identified by the words "SERIAL NO." printed on the back. Always reference this information in any correspondence.

PHP2700
Model No.

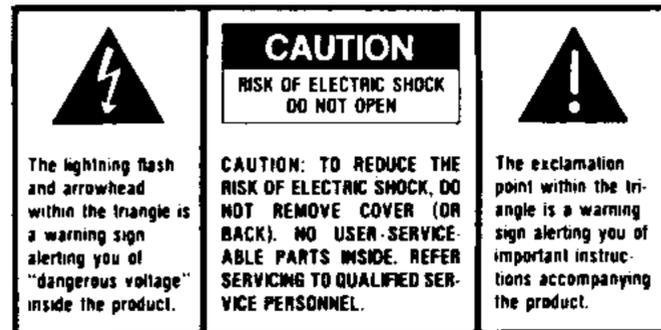
099939
Serial No.

7/30/83
Purchase Date

TEXAS INSTRUMENTS HOME COMPUTER

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WARNING: TO PREVENT FIRE OR ELECTRIC SHOCK HAZARD, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE.

INTRODUCTION

Your TI Home Computer system can be greatly expanded in power and versatility by including a data storage/retrieval system which allows you to store and retrieve data you enter into the computer (programs, numerical data, etc.). There is not a more economical way to do this than with the TI Program Recorder (Model PHP2700). By recording programs and data on a tape, you save them as a permanent record, and later you can load the data from the cassette tape into the computer's memory if you wish to use that information again. Several of the Solid State Cartridges allow you to store and retrieve data you've used or developed with their software programs.

The TI Program Recorder's features include:

- Digital Counter with reset for program location.
- Color-coded input jacks for easy set-up.
- Variable volume and tone controls with Preferred Setting indicators.
- Reliable loading, storage, and retrieval of data on audio cassette tapes.
- Optional power source capability from
 - AC Line Cord (included).
 - Four "C" Batteries (not included).
- Computer Interface Cable (included).
- Unit may also be used as audio cassette tape recorder.

In addition, an extensive library of TI preprogrammed software is available on cassette tapes for use with your Program Recorder. The Texas Instruments Program Recorder is designed specifically for your TI Home Computer and offers you an inexpensive, reliable data storage/retrieval system. Get the most from your cassette memory system by first reading this manual to become familiar with the procedures, and then use the system for your own applications.

SET-UP INSTRUCTIONS

Power to run the program recorder is not supplied by the TI Home Computer. Connect the AC power cord to the recorder, or install four "C" batteries by following the simple steps listed below.

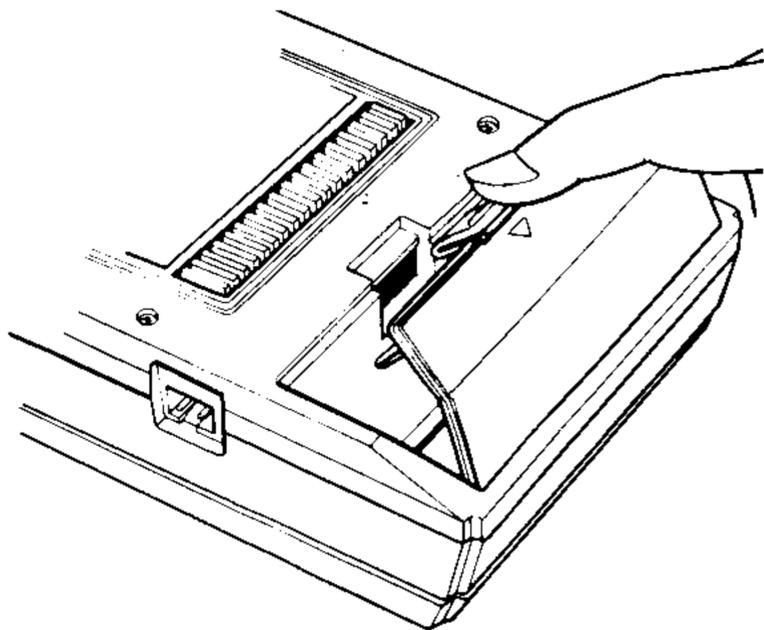
AC Power Operation

1. Plug the AC power cord into the "AC input" jack on the left side of the cabinet.
2. Plug the opposite end into a standard 110-115 V outlet. Battery power is automatically shut off when the AC power cord is plugged into the recorder.

NOTE: The Program Recorder will not operate on battery power with the AC power cord plugged into the unit. The power cord must be disconnected from the recorder for battery-powered operation. Also, always push the STOP button before storing the recorder to relieve pressure on certain parts in the recorder which can be damaged if left under constant pressure for long periods of time.

Battery Operation

1. Remove the battery door on the back of the unit by pressing downward on the door latch located on the bottom of the recorder.



2. Insert four "C"-size carbon zinc or alkaline batteries (not included) into the battery compartment. Be sure that the positive (+) or cap ends of each battery are installed as shown inside the battery compartment.
3. Replace the battery door.

NOTE: If the tape reels turn very slowly or not at all, or if the computer develops problems reading or loading data, check the system with a new set of batteries or with a new cassette tape. Also, when the recorder is not in use, always push the STOP button to relieve pressure on certain parts in the recorder which can be damaged if left under constant pressure for long periods of time.

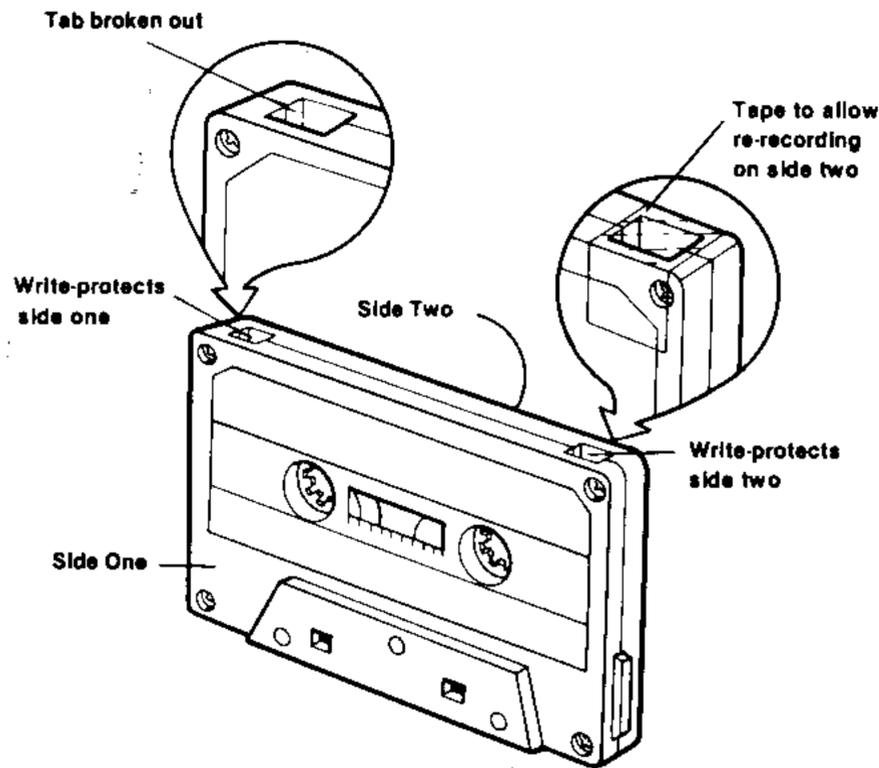
IMPORTANT: Remove the batteries when storing the recorder for more than a few weeks at a time. Leaky batteries can severely damage the unit.

Control Buttons

1. RECORD—To record a program or data, press the RECORD and PLAY buttons simultaneously.
 2. PLAY—Press the PLAY button to load data into the computer's memory.
 3. REWIND—Press the REW button to rewind the tape to the beginning of a program or the beginning of the tape. When the desired position is reached, press the STOP button.
 4. FAST FORWARD—Press the F. FWD button to skip over portions of the tape quickly. When the desired position is reached, press the STOP button.
 5. STOP—Press the STOP button to stop recording, playing, fast forward, or rewind.
 6. EJECT—To open the cassette compartment door and eject the cassette tape, press the EJECT button.
 7. PAUSE—The PAUSE switch lies between the control buttons and the cassette compartment. Slide the switch toward PAUSE and the tape stops in any mode. To continue operation, slide the button to the PLAY/RECORD position. The PAUSE switch should be used only when you are recording or playing music or voice. In these instances, it is convenient for temporary stops in the RECORD or PLAY mode.
- NOTE:* Make sure that the PAUSE switch is pushed toward PLAY/RECORD when loading or saving data.

Tape Erase

Each time a recording is made, any previously recorded material on the tape is automatically erased. If you have a recording you wish to keep permanently, break out the rear left tab of the side you want to save. When a cassette with the tab broken out is inserted in the tape unit, the RECORD button cannot be pressed. A piece of cellophane tape placed over the tab opening will allow the tape to be recorded over.

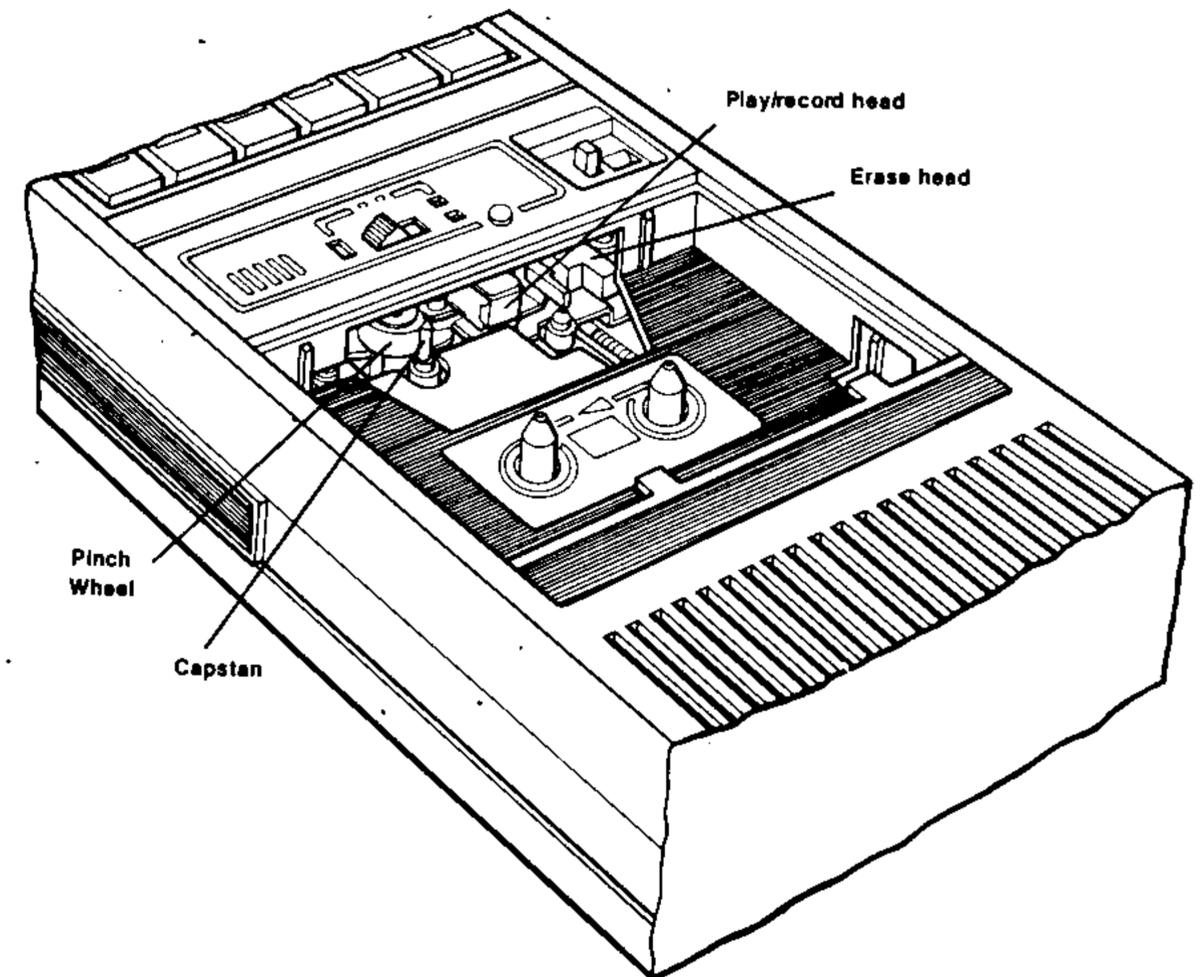


Cleaning the Tape Heads

In order to insure quality recording and playback of data, it is important to clean the play/record head and the erase head of the recorder periodically (after every 30 to 40 hours of use or more often if needed). Iron oxide particles build up, in time, on the parts which come in contact with the tape. These deposits sometimes prevent automatic stop at the end of the tape. They can also cause incomplete erasure of data and distorted data transfer between the computer and the recorder.

Clean the tape heads and capstan by following the simple steps below.

1. **CAUTION:** Unplug the recorder from AC power before cleaning.
2. Press EJECT to open the cassette compartment door.
3. Press the PLAY button so the play/record and erase heads project outward in the compartment.
4. Wipe the play/record and erase heads gently with a soft cloth or cotton swab moistened with rubbing alcohol. Also wipe the pinch wheel and capstan.
5. Close the cassette compartment door and press the STOP button.



Cassette Interface Cable

The TI Program Recorder is connected to the Home Computer by the Cassette Interface Cable. This cable has a 9-pin "D" connector on one end (for connection to the computer) and a triple-plug (for connection to the recorder) on the other.

NOTE: The Program Recorder is compatible with the TI double Cassette Interface Cable (not included). This cable has the standard 9-pin "D" connector, a triple-plug, and a double-plug for connection to a cassette recorder. If you use this cable with your Program Recorder, connect only the triple-plug as described below. The double-plug remains unconnected.

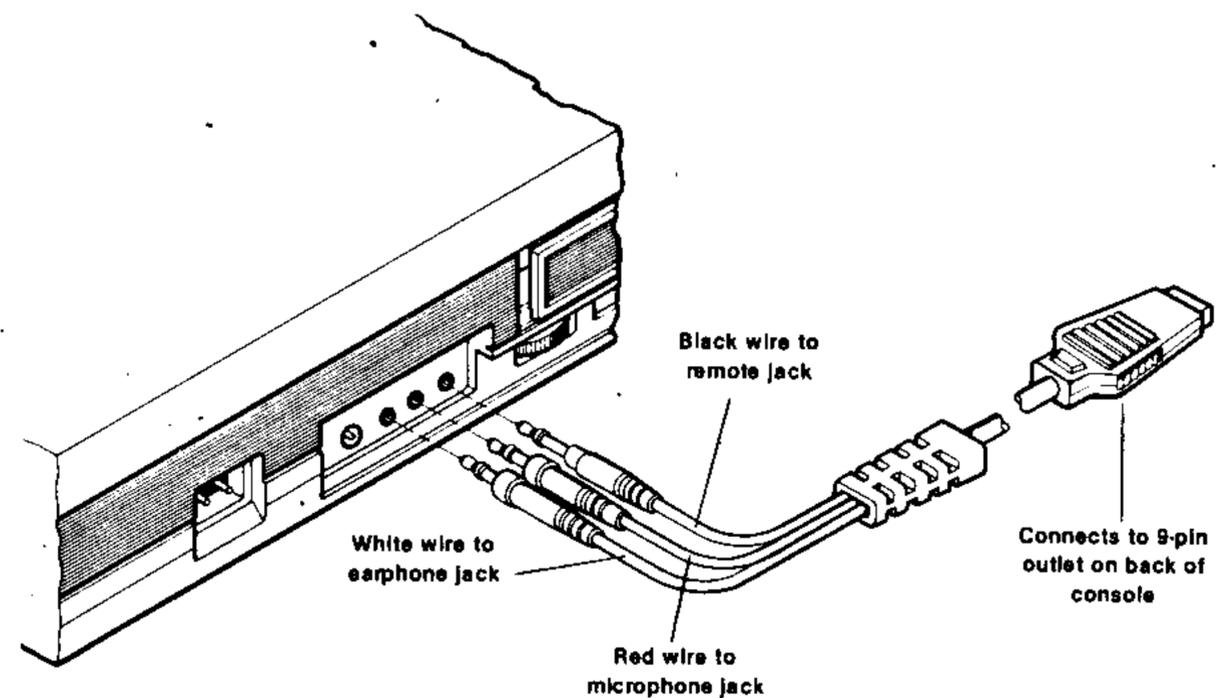
Connecting the Program Recorder to the Computer

To connect your program recorder to the computer, follow these simple steps:

1. Insert the 9-pin "D" connector on the single plug end of the cable into the 9-pin outlet on the **back** of the console. (Do not confuse this with the 9-pin connector on the side of the console. The connectors are not interchangeable.)

2. Attach the triple-plug end to the program recorder using the color-coded plugs and jacks as follows:

- Insert the plug with the red wire into the microphone jack.
- Insert the plug with the black wire (the smaller plug) into the remote jack.
- Insert the plug with the white wire into the earphone (external speaker) jack.



Cassette Tapes

Blank cassettes are used for recording your own programs and data or for storing data obtained with one of the Solid State Cartridges which utilize a data storage/retrieval system. TI's preprogrammed Cassette Software packages can also provide you with ready-made programs for use with your Program Recorder.

NOTE: Some special-formula tapes, such as chromium dioxide and metal-particle tape, do not record properly with this system. High quality conventional cassette tapes with a playing time of 20 minutes are recommended for best recording and playback results. However, tapes with playing lengths of up to 60 minutes may be used. Tapes with longer playing times are not recommended.

Cassette Tape Insertion

To insert a cassette into your recorder, follow these simple steps:

1. Press the STOP button if any of the other function buttons are presently activated.
2. Press the EJECT button to open the cassette compartment door.
3. Insert the cassette with the full reel of tape on the left and the exposed tape facing you (tape movement for normal record and play functions is from left to right). Then close the cassette compartment door.

Tone and Volume Control Settings

After the cable is connected, adjust the tone and volume controls by turning them until the white markers on each control are in the center of the visible portion of each control wheel. These Preferred Setting indicators mark the positions for proper data transmission for most TI Home Computer consoles and Program Recorders.

If your computer returns an error message after attempting to load data into the computer's memory with these volume and tone control settings, follow the simple steps below to correct the problem. Be sure to note which of the two error messages is displayed; the correct procedure depends on the type of problem you encounter.

If, after attempting to load data, your computer returns the error message

ERROR – NO DATA FOUND
PRESS R TO READ
PRESS E TO EXIT

increase the volume by turning the volume control approximately 1/16 of a turn. Then press **R** to read the data again. Keep repeating this procedure until the data is read correctly.

If the computer returns the error message

ERROR IN DATA DETECTED
PRESS R TO READ
PRESS E TO EXIT

decrease the volume by approximately 1/8 of a turn. Then press **R** to read the data again. Continue to repeat this procedure until the data is read.

TO SAVE OR LOAD DATA

If you have your program recorder connected to the console as instructed, you are ready to save or load data. Before you attempt to save or load data, make sure that

- You are using high quality audio tape. Poor quality tape yields poor performance.
- The tape is not longer than C-60 (not longer than 30 minutes on each side). Longer tapes are thinner and provide less fidelity.
- The program recorder is not located within two feet of the monitor or a television set (to minimize magnetic field interference).
- The tape is never placed within two feet of the monitor, a television set, an electric motor, or any other strong source of magnetic fields (to avoid accidental erasure of your data).
- The system (computer console, Program Recorder, and monitor or television set) is not located on a continuous metallic surface (to minimize conducted noise).
- You are using CS1 as the device name or filename of your Program Recorder or cassette tape when you load or save data.

To Locate a Program on a Cassette Tape

You may often have more than one program on a single side of a cassette tape. In order to save or load programs accurately, you must know the exact location of each program on the tape. If you record over a part of or all of another program, that program will be erased, leaving only the newly recorded data. Follow these directions to determine the exact location of all programs:

1. Rewind your tape, and then reset the counter to zero.
2. Disconnect the Interface Cable from the program recorder. You now can hear what is on the tape as it plays.
3. Press PLAY.
4. A blank section of tape precedes each program on TI's prerecorded Cassette Software. When you load your own programs onto a tape, leave a blank section of tape (5 to 10 positions on the digital counter) between programs to provide an easily identifiable beginning and end for each program. When you first hear program data, note and write down the position of the counter beside the program name. You may want to subtract 1 or 2 from the counter reading to ensure that, when you load the program, the beginning of your program loads properly.
5. Use these counter settings in the future to quickly load cassette tape programs.

NOTE: This process can be speeded by alternating between PLAY and FAST FORWARD as you listen.

NOTE: Used with TI Extended BASIC, the Memory Expansion Peripheral Card adds 32K bytes of Random Access Memory (RAM) to the built-in memory of the computer. However, even with the Memory Expansion available, the largest program that can be stored on a cassette is 12K bytes (approximately 12,000 characters) in size. Although the length of the actual program is limited by the amount of available memory in the console, utilizing the Memory Expansion unit provides other advantages. For example, with the unit installed in the Peripheral Expansion System, your program can be up to 12K bytes in length, while any data generated by the program can be stored in the Memory Expansion. Without the unit, the program must be shorter so that both it and the generated data can be stored in the computer's built-in memory.

To Save Data in TI BASIC

The SAVE command allows you to copy the current TI BASIC program in the computer's memory onto the cassette tape. By using the OLD command, you can later read the program back into the computer's memory for running or editing.

To save a program that you have entered into your computer's memory, type SAVE CS1 and press ENTER. The computer then begins printing directions on the screen to help you follow the SAVE procedure. From this point on, the procedure for saving programs/data with TI BASIC or with cartridges is the same. See "The SAVE Procedure" section on page 14 for complete details.

To Save Data When Using a Solid State Cartridge

After you have entered your data into the computer and connected the recorder to the computer (with a good quality tape cassette in place), you are ready to begin recording. Select the SAVE option offered by the cartridge program you're using. The computer then offers you a list of options for saving data. You'll get an error message if you select an option for a device that is not turned ON. Since you want to save your data on your program recorder, select CS1 (cassette unit 1) from the options list.

NOTE: Some cartridges will ask you to input either "device name" or "file name" instead of selecting CS1 from a selection list. In this case, type CS1 for the input, and then press ENTER. Also, some cartridges offer the option of storing data on CS2. Disregard this option and always use CS1.

From this point on, the procedure for saving programs/data with cartridges or TI BASIC is the same. See "The SAVE Procedure" section on page 14 for complete details.

The SAVE Procedure

Below are the directions which the computer prints on the screen to help you through the procedure. Follow each direction as it appears.

In the first set of instructions, "* REWIND CASSETTE TAPE CS1" means to locate a blank section of tape (either at the beginning if the tape is blank or after the last recorded program if it has been used before) so that you do not inadvertently record over another program you wish to keep. The computer controls the recorder motor power, so the tape does not start to move until you press ENTER at the points indicated.

- * REWIND CASSETTE TAPE CS1
THEN PRESS ENTER
- * PRESS CASSETTE RECORD CS1
THEN PRESS ENTER
- * RECORDING
- * PRESS CASSETTE STOP CS1
THEN PRESS ENTER

Once all the data is recorded, you'll be asked:

- * CHECK TAPE (Y OR N)?

At this point you may choose to let the computer check your tape to make sure that everything was recorded properly. It is strongly recommended that you do so to ensure the accuracy of your tape for future use.

NOTE: The single-letter responses (Y, N, R, etc.) you give during the SAVE routine must be upper-case characters. Lock down the ALPHA LOCK key, or hold down the SHIFT key, and press the appropriate letter key.

If you decide not to check the tape, press N for no. Remove your tape, and label it for future reference. If you want to check the tape, press Y for yes. Again, the computer guides you with the following messages:

- * REWIND CASSETTE TAPE CS1
THEN PRESS ENTER

Rewind the tape (before pressing ENTER) to the point where you began recording your data. If you stored your data at the beginning of the tape, simply rewind the tape to the beginning. If, however, you began at a point other than the beginning of the tape, rewind the tape to that position, and press the "stop" button on the recorder. Then press ENTER.

- * PRESS CASSETTE PLAY CS1
THEN PRESS ENTER
- * CHECKING

If the following messages appear on the screen, your data were recorded properly. Follow the directions in the messages, remove your tape, and label it for future use.

- * DATA OK
PRESS CASSETTE STOP CS1
THEN PRESS ENTER

If, however, the data were not recorded properly, you'll receive one of two error messages. The first is:

- * ERROR - NO DATA FOUND
PRESS R TO RECORD CS1
PRESS C TO CHECK
PRESS E TO EXIT

This error message means that your data were not recorded or did not play back. The second error message is:

- * ERROR IN DATA DETECTED
PRESS R TO RECORD CS1
PRESS C TO CHECK
PRESS E TO EXIT

This error message means that some part of your data did not record properly.

Before you go further, you may want to recheck these items:

- Is the recorder at a proper distance from your television monitor (two feet or more)?
- Is the recorder properly attached to the computer?
- Is the cassette tape in good condition? (If in doubt, try another tape.)
- Are the cassette recorder volume and tone adjusted correctly? Was the volume too high or too low?
- Does the cassette tape head need cleaning?
- Is the system located on a metal surface?

When you have checked these, you can choose one of these three options:

- Press **R** to record your program again. The same instructions listed previously will guide you.
- Press **C** to repeat the checking procedure. At this point you may wish to adjust the recorder volume and/or tone controls. See "Tone and Volume Control Settings" (page 10).
- Press **E** to "exit" from the recording procedure. The computer will tell you to stop the cassette and press **ENTER**.

* PRESS CASSETTE STOP CS1
THEN PRESS ENTER

When you press **ENTER**, an error message appears on the screen, indicating that the **SAVE** routine did not properly record your program. After checking your recorder, you can try to record the program again. When the flashing cursor reappears on the screen, enter any **BASIC** command you wish.

NOTE: When using a cartridge, the "exit" key takes you back to the beginning of the **SAVE** option. Thus, when you press **ENTER**, you see the "Save Data" screen and can try to store your data again. Just follow the instructions as they appear on the screen.

When the **SAVE** command is performed, the program remains in memory whether or not an error occurs in recording.

To Load Data in TI BASIC

The **OLD** command loads a previously saved program into the computer's memory. You can then **RUN**, **LIST**, or change the program. First, connect your cassette recorder to your computer. Then insert into the recorder the cassette on which you saved the information. To load the program, type **OLD CS1** and press **ENTER**. The computer begins printing instructions on the screen to help you through the procedure. From this point the procedure for loading data or programs into the computer is the same whether you are loading a program or data file in **TI BASIC** or loading data for use with a cartridge. See "The Old Procedure" on page 17 for complete details.

To Load Data When Using a Solid State Cartridge

The next time you want to use the information stored on the tape, you'll need to "load" your data—that is, read the data you saved on tape into the memory system of the computer. First, connect your cassette recorder to your computer. Then insert into the computer the cartridge from which you saved the information, and locate the beginning of the program you wish to load.

When you're ready to "load," select the "LOAD DATA" option of the cartridge. When the computer asks, press the **1** key to indicate the information is being read from a cassette. Then press the **1** key again to select cassette unit **CS1**. From this point, the computer prints instructions on the screen for you to follow. They are listed below.

The OLD Procedure

Below are the instructions displayed on the screen when you enter the **OLD** command. In the first set of instructions, "* **REWIND CASSETTE TAPE CS1**" means to locate the beginning of the program or data you wish to load. The computer controls the recorder motor power, so the tape does not start to move until you press **ENTER** at the points indicated.

* **REWIND CASSETTE TAPE CS1**
THEN PRESS ENTER
* **PRESS CASSETTE PLAY CS1**
THEN PRESS ENTER
* **READING**

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It takes some time to read in the data, depending on the amount of information stored. When the computer finishes loading the data, it tells you whether or not it read the data properly. If the data were read correctly, you'll see the following messages on the screen:

- * DATA OK
- * PRESS CASSETTE STOP CS1
THEN PRESS ENTER.

Your data are now loaded. You are ready to use the cartridge or your program.

If, however, the computer did not successfully read your program into memory, an error occurs and the computer prints an error message.

- * ERROR - NO DATA FOUND
PRESS R TO READ
PRESS C TO CHECK
PRESS E TO EXIT

In this case, you may choose either of these options:

- Press R to repeat the reading procedure. Before repeating the procedure, be sure to check the items listed in "The SAVE Procedure" on page 14.
- Press C to check the data you have read into memory. At this point you may wish to adjust the volume and tone controls. See "Tone and Volume Control Settings" (page 10).
- Press E to "exit" from the loading procedure. An error message (such as the one below) is displayed, indicating that the computer did not properly read your program into memory.
 - * I/O ERROR 56

Check the list of error messages in the *User's Reference Guide* to analyze the problem and find a solution. Even though the program has not been successfully read into the computer's memory, it may overwrite part or all of any program that was previously in memory. You may want to LIST and check the memory contents before going on.

When the flashing cursor reappears on the screen, you may enter any BASIC command you wish.

NOTE: The single-letter responses (E or R) you give during the OLD routine must be upper-case characters.

FILE PROCESSING

With the TI Program Recorder, you have the capability of storing not only programs, but also data files, which contain information to be used with your programs. Below is a sample program, information for a data file, and instructions for their use. Use this information as an example, and you can later create your own data files to be used at any time you need them and as often as you wish.

1. Type the program into your computer's memory and store it on cassette using the SAVE CS1 command.

```
100 CALL CLEAR
110 PRINT "1 OUTPUT DATA":
120 PRINT "2 INPUT DATA"
130 PRINT "::::"
140 INPUT "INPUT CHOICE?":Z
150 ON Z GOTO 160,280
160 FOR X = 1 TO 5
170 CALL CLEAR
180 INPUT "ACCT # ":A$(X)
190 INPUT "ACCT NAME ":B$(X)
200 INPUT "ACCT BALANCE ":A(X)
210 NEXT X
220 OPEN #1:"CS1",INTERNAL,FIXED,OUTPUT
230 FOR X = 1 TO 5
240 PRINT #1:A$(X),B$(X),A(X)
250 NEXT X
260 CLOSE #1
270 GOTO 100
280 CALL CLEAR
290 OPEN #1:"CS1",FIXED,INTERNAL,INPUT
300 FOR X = 1 TO 5
310 INPUT #1:A$(X),B$(X),A(X)
320 NEXT X
330 FOR X = 1 TO 5
340 PRINT A$(X)
350 PRINT B$(X)
360 PRINT A(X):
370 NEXT X
380 INPUT "PRESS ENTER TO CONTINUE":CS
390 GOTO 100
```

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2. Run the program, and select from the choices on the screen either (1) for creating a data file, or (2) for loading a data file.

3. To create a data file, select (1) and you are prompted to input the following:

Acct #
Acct Name
Acct Balance

Enter these accounts in the program as you receive the prompts.

001
Lang Institute
30000
002
A. T. Optical
50000
003
Grantham Const.
75000
004
Technical Electric
10000
005
Service Clothiers
75000

4. After you enter the above information, the program will automatically prompt to record the accounting data.

NOTE: When saving the data file, be sure that you do not save the data information over the program which you saved earlier. Before saving the data, position the tape to a point located after the program file.

5. After the accounting data is entered and recorded, selecting (2) from the choices on the screen automatically starts the prompting for loading the previously saved data.

For detailed information concerning the use of data files, consult the File Processing section of the *User's Reference Guide*.

IN CASE OF DIFFICULTY

If the Program Recorder does not appear to be working properly, check the following:

1. **Power**—Be sure all devices are plugged in and connected properly.
2. **Cassette Interface Cable**—Check that the proper cable is being used. Check the cable for loose or broken leads. Check to see that the cable is properly connected.
3. **Tone and Volume Control Settings**—Check to make sure that the volume and tone control settings are correct. See "Tone and Volume Control Settings" on page 10.
4. **Cassette Tape**—Make sure that you are using high quality tape in good condition. The tape should not be longer than C-60 (not longer than 30 minutes per side).
5. **Magnetic Fields**—Be sure that the Program Recorder and the cassette tape are not located within two feet of the monitor, a television set, an electric motor, or any other strong source of magnetic fields (to avoid accidental erasure of your data).
6. **Location**—Make sure that the system (computer console, Program Recorder, and color monitor or television set) is not located on a continuous metallic surface (to minimize conducted noise).
7. **Device or Filename**—Be sure that you refer to your Program Recorder as CS1 when you load or save data.
8. **Tape Heads**—Make sure the tape heads are clean. See "Cleaning the Tape Heads" on page 6.
9. **PAUSE Switch**—Make sure the PAUSE switch is off (pushed toward the PLAY/RECORD position) when saving or loading data.

Exchange Centers (Local Service Options)

If your Program Recorder requires service, instead of returning it to a service facility for repair or replacement, you may elect to exchange it for a factory reconditioned unit by going in person to one of the exchange centers which has been established across the United States. A handling fee will be charged by the exchange center for in-warranty exchanges. Out-of-warranty exchanges will be charged at the rates in effect at the time of the exchange. Please refer to the enclosed Exchange Service listing or call the Consumer Relations Department for exchange fee information and the location of the nearest exchange center.