User Manual

Tektronix
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SDP2000
Signal Development Program

070-9267-05

This document supports firmware version 3.1 and above.

Table of Contents

Getting Started

The SDP2000 Signal Development Program is a Microsoft Windows-based program for creating and downloading signals to the Tektronix TG2000 Signal Generation Platform.

The most basic way to use the package is to select precompiled signals from the provided library, and download them to the TG2000. You can also create custom signals for the TG2000, using provided equations or equations you create with a compiler, such as Borland or Microsoft.

You can use serial, parallel, or GPIB communications to download signals. Files can also be stored on a floppy disk (in the form of encapsulated DNL files) and loaded into the TG2000 floppy drive. Signals created at a central location can be copied on disks and distributed to several remote locations or can be linked over a network.

The SDP2000 Package

The SDP2000 package contains two parts: the SDP2000 program and the TGCOMM program.

SDP2000 Functions

- Modify or create a download file
- Modify or create a video frame
- Modify or create horizontal waveforms
- Modify or create television signal formats

TGCOMM Functions

- View the directory and signal hierarchy of the TG2000
- Download provided or custom signals to the TG2000
- Delete signals from the TG2000

System Requirements

The SDP2000 will run on an IBM AT (or compatible) computer that meets the following minimum qualifications:

- 6 MB hard drive space is required to load and run the program.

- 25 MB hard drive space is required to load and run the entire program and signal libraries.

- A 1.44 MB, 3.5 inch floppy drive or a CD drive is typically used to load the SDP2000 program.

- Microsoft Windows 95 is recommended. (Microsoft Windows 3.1 or above is required.) All features except the parallel port are compatible with Microsoft Windows NT. All features are compatible with Microsoft Windows 95.

- A serial port (RS232), a parallel port (Centronics compatible), or a GPIB port can be used for communications with the TG2000 Platform. Signals can also be downloaded to the TG2000 using a 3.5 inch disk.

- To use GPIB communications, you must have the GP1 module installed in the TG2000 Platform. An AS3FG210 GPIB-PCIIA Interface Card provides the type of GPIB interface card needed.

- 4 MB free RAM memory is required.

- A 486 (66 MHz) or better is required.

- A mouse is required.

- A VGA monitor (800 x 600 resolution with 256 color or better) is required.

Installation Procedure

To install and use this program, you should be familiar with Microsoft Windows operations and commands. If necessary, review your Microsoft Windows user manual before proceeding.

You may run the SDP2000 program from the CD, or install it on your computer and run it from there.

Use this procedure if you decide to install the SDP2000 program on your computer:

1. Start Microsoft Windows if it is not already running. Quit all other Windows applications before beginning installation.

2. Insert the SDP2000 CD into the appropriate drive in your computer.

3. Run the file named Setup.exe. Proceed through the following setup windows. You can select **Back** in any window, to return to the previous window.

   a. Welcome window.
   Read the information, and then choose **Next** to proceed.

   b. Choose Destination Location window.
   The default installation location is C:\SDP2000; choose **Browse** if you want to install the program at a different location. Choose **Next** to proceed.

   c. Select Components window.
   Deselect all module libraries that you do NOT wish to install by clicking in the box preceeding each undesired component. Always leave the Program selected.

   Refer to the amount of memory needed to install each component, shown to the right of the component. Also refer to the bottom of the window, where you can see the amount of space needed to install all currently selected components, as well as the amount of space available on your system. (The amount available on the selected drive may be significantly less than the total amount of space available on the entire system.)

NOTE. *The first time you install the SDP2000, install the Program and at least one module library. Later, you can run Setup.exe again and install additional module libraries. Always leave the Program selected.*

Choose **Next** to proceed.

d. Select Program Folder window.
The default name for the program folder is displayed; if you want to change the name, type in a new name or browse to select a different name.

Choose **Next** to proceed.

Installation begins

e. Setup Complete window.
You will see the message that Setup has finished installing the SDP2000 Signal Development Package on your computer. Check **Yes** if you want to read the release notes and **Yes** if you want to run the program now.

Choose **Finish** to complete the installation.

Remove the CD from your drive.

You have completed the software installation procedure.

Removing the Software

To remove an SDP2000 library from your hard disk, delete the directory. You can also delete individual files.

To remove the entire software package from your hard disk, and reset any changes to the computer's configuration, run the uninstallShield program that was installed automatically with your SDP2000 program.

Remote Connection

To connect your computer with a TG2000, refer to *Appendix A: Remote Interface*.

Using the SDP2000

This manual provides information to get you started using the SDP2000 program, such as installation, tutorials, and remote hookup. For more information about using the application, use the SDP2000 and TGCOMM online help.

Online Help

Double click on the Microsoft Windows icon to open the SDP2000 or TGCOMM program. In the SDP2000 or TGCOMM window, choose Index from the Help menu. This displays the main online help window. To learn how to navigate through the online help, choose How to Use Help from the Help menu.

To display context-sensitive help for a feature (such as a button or menu item), choose the arrow and question mark icon from the toolbar and then click on the desired feature. You can also use the F1 key to obtain context-sensitive help for a selected feature in any of the SDP2000 editors.

Illustrations in the online help are optimized for a VGA monitor.

The help buttons function as follows:

- **Contents** returns to the Help Contents page.

- **Search** searches for specific topics.

- **Back** returns to the previously displayed topic.

- **History** goes to any of several previously displayed help topics.

- **Glossary** displays the glossary and allows jumps to glossary topics.

- **<<** and **>>** move forward and backward through browse topics.

Technical Assistance

For technical assistance with the SDP2000 package, call 1-800-833-9200, and select option 3, or . It will be helpful to have your Tektronix TG2000 serial number and version numbers, as well as your SDP2000 version number, ready when you call.

To find the TG2000 version numbers, push the Utilities button on the TG2000 platform front-panel, and then touch the Versions icon on the display. Make a note of all version numbers.

To find the SDP2000 version numbers, use the Help About command in the Help menu.

Operating Basics

Operating Basics contains the Functional Overview and the
Tutorials.

Functional Overview

Both the SDP2000 program and the TGCOMM program are installed
when you install the SDP2000 package. The TGCOMM program
operates as a separate Windows application and can run at the same
time as the SDP2000 program.

SDP2000 Editors

The SDP2000 program consists of four editors plus a link to the
TGCOMM communications program. Multiple editors and
documents can be open at the same time.

Format Editor. Use the format editor to chose a format or to create
new formats. A format defines the characteristics that the signal will
adhere to. The signal format encompasses both the picture scanning
structure (the number of lines per frame, the field rate, and the
field:frame ratio) and the method used to encode chrominance and
luminance information (GBR; Y,P_B,P_R).

Waveform Editor. Use the waveform editor to create or edit equation
(.eqn) files. Equation files describe the line waveforms that make up
test signals for the TG2000. Each equation file describes one
waveform. Equation files are used by the frame editor.

Frame Editor. Use the Frame editor to determine which horizontal
waveforms will go into the frame and where those waveforms will
go. Frame editor files have the extension .men. After you enter the
desired information in the .men file, you build the frame, and the
Frame editor creates a .cmp file. The .cmp files are used by the
Download editor.

Download Editor. Use the Download editor to take the .cmp file created by the Frame editor and make a download file (.dnl) that can be sent to the TG2000. These files contain records and data for one or more TG2000 modules. (An entire instrument setup of all the module signals can be contained within one download file.) You can also modify existing .dnl files.

Communications. You can download files to the TG2000 using a serial, parallel, or GPIB port, or a 3.5 inch disk. To connect your computer to a TG2000, refer to *Appendix A: Remote Interface.*

SDP2000 File Types

The SDP2000 package contains signal files for the various TG2000 modules. These files are stored on the drive that you select during SDP2000 installation, in a directory named SDP2000. You can modify copies of the SDP2000 files, but keep the original files unchanged.

To locate files, you can use the Windows File Manager or the File Open command (limit the search to the SDP2000 directory and to files of the desired type).

Download Files. Download files (.dnl files) are logically organized sets of compiled signals. You can send part or all of a download file to the TG2000.

Compiled Signals. Compiled signals (.cmp files) are built by the Frame editor, using source files. You can use compiled signals to create your own download files. The .cmp files have a DOS file name, as well as a longer, more descriptive name. You define the descriptive name by entering it in the frame file (.men) in the "framename" field.

Source Files. Source files consist of menu files (.men files) and equations (.eqn files). For digital formats, insert files (.ins files) are also used as source files, to define the SAV, EAV, and other locations in terms of sample points.

Menu Files. Menu files (.men files) are Frame editor files that you can edit. Menu files contain equations. Menu files can also contain instructions and notes that you provide.

Equation Files. Equation files (.eqn files) define the horizontal waveform.

Download File Structure

The file structure of a download file determines how the signals are accessed on the TG2000 screen, so it is important to use a logical file structure when creating or modifying a download file.

The SDP2000 download files provided with the SDP2000 package are organized as follows:

1. Module. Corresponds to the TG2000 module (such as AVG1).

2. Signal Set. Corresponds to the television signal format (such as NTSC or PAL).

3. Button. Corresponds to the type of signal (such as Color Bar)

4. Signal. Lists signals of the specified type (such as 75% and 100% Color Bars). These are .cmp files.

5. Modified signal. Lists signals that are created by the TG2000. These signals are dependent on the signal above them. The modified signal file does not contain all information necessary to define a signal.

Viewing a Sample Download File

1. From the main SDP2000 window, choose Open from the File menu. In the File Open dialog box, select the working directory that you specified during SDP2000 installation. Specify .dnl files in the "List Files of Type" box to display only download files. Open the file named SDP2000.dnl. (See Figure 1.)

Figure labels (left to right pointing into the window):
- Module → AVG1
- Signal Set → NTSC
- Button → Color Bar
- Signals → Freq Resp

Window title: Tektronix SDP2000 - SDP2000.DNL

Menu: File Edit View Communication Options Window Help

Window title: SDP2000.DNL

Left pane tree:
- AVG1
  - NTSC
    - Color Bar
    - Linearity
    - Flat Field
    - Freq Resp
    - Other
    - Monitor
    - Pulse & Bar

Right pane:

Signal	Value
10 Step	539
5 Step	517
Luminance^Ramp	709
Modulated^10 Step	560
Modulated^5 Step	538
Modulated^Ramp	728
Modulated^Shallow Ramp	791
Shallow^Ramp	770

For Help, press F1

Figure 1: Sample Download file

2. Each TG2000 module that you selected during installation is represented by a module (such as AVG1 and DVG1). Select the desired module (such as AVG1), and choose OK.

3. The download file is displayed in a table of contents format, with the top level module name (AVG1 in this example) in the left half of the download window. There are two ways to display all levels:

- Double click on the displayed AVG1 module icon and each icon below it to open all signal levels.

- In the Download editor, use the Expand All command from the View menu to display all signal levels. (To return to the top level only display, use the Collapse All command.)

General Interface

The main SDP2000 window appears when you first start the program. It displays a menu line with items that are pertinent to the active window.

For example, if a new document is opened in the Waveform Editor, the Waveform Editor menu items are displayed in the main window. If the Format Editor is chosen, the Format Editor menu items are displayed.

Menu items that pertain to all windows are displayed at all times, but they may be rearranged depending on the active window.

You can have help and SDP2000 windows open at the same time. Refer to Windows documentation for information on sizing and arranging the windows on screen.

Mouse

Use the mouse in the SDP2000 program to select, choose, size, and move items just as you do in Windows.

Tutorials

All of the information in these tutorials appears in the SDP2000 or TGCOMM online help. Before proceeding, you should be familiar with Windows operations and commands. If necessary, review your Windows documentation.

Downloading

Floppy Disk. To download files using a floppy disk, place a 3.5 inch disk in your computer floppy drive and copy the download file or files to the disk. You can use the Windows File Manager to do this. Insert the disk in the TG2000 floppy drive and follow the TG2000 instructions for downloading files.

Remote Communications. To download files to the TG2000 using remote communications:

1. Make sure your computer is connected to the TG2000.

2. Use one of these three ways to open the TGCOMM program:

   ■ Choose Serial, Parallel, or GPIB from the SDP2000 Communications menu to open the TGCOMM program in the selected communication mode.

   ■ Double click on the TGCOMM icon to open the TGCOMM independently of the SDP2000.

   ■ Locate the file named TGCOMM.exe in the directory where the SDP2000 is installed. Either double click on the .exe file or choose the Run command from the File menu.

3. From the Settings menu, choose Serial, Parallel, or GPIB.

   ■ For Serial, set the baud rate to match the TG2000, and select an available computer port for communications (COM1, COM2, COM3, or COM4). On the TG2000, set the Mode to Computer and the Flow Control to CTS/RTS. Be sure that the CTS and RTS lines (pins 7 and 8 on the 9-pin serial connector) are connected.

   ■ For Parallel, select an available port (1, 2, or 3).

- For GPIB, set the address to match the GPIB address of your TG2000 Platform. (On the TG2000 Platform front-panel, push the Remote button, then touch GPIB setup on the display to find the GPIB address.)

4. Identify a download file or signal that you want to send to the TG2000 Platform. A sample download file, SDP2000.dnl, is stored on the drive that you selected during SDP2000 installation, in a directory named SDP2000.

5. Open the download file, and highlight the files that you want to download.

6. From the Download menu, select Serial, Parallel, or GPIB. The program will state whether there is enough memory available in the TG2000 to download the files you have selected. If there is enough memory, and if none of the files you are downloading conflict with existing TG2000 files, downloading will occur.

7. If file name conflicts exist, a dialog box appears. Select the TG2000 files to be overwritten. To return to the table of contents display of the download file, choose Quit. To continue the download process, choose Continue Download.

   The status bar provides a download message, giving the percent complete.

Using the TG2000 Display

When you open a download file in the TGCOMM program, it is displayed in a table of contents format. The module, signal set, and button names are displayed on the left side of the window.

The path name and signal size of the selected TG2000 module, signal set, button, or signal is displayed in the bottom part of the TGCOMM window. If only one signal is selected, the TGCOMM also displays the date that the signal was created.

When you are downloading files, it is useful to display a list of signals that are already present in the TG2000, to determine whether you are adding new files or replacing existing files.

To display a list of signals that are present in the TG2000:

1. Make sure your computer is ready to communicate with the TG2000.

2. Use the TG2000 Signals command from the View menu, and choose Serial, Parallel, or GPIB.

   The SDP2000 uses the selected communication mode to display the list of TG2000 signal names in the right side of the window. This display provides information about the TG2000 signals, such as .cmp version number.

3. To refresh the display after changes to the TG2000 signals, choose the eyeglasses icon from the toolbar.

Deleting Signals Using the TGCOMM

To delete signals from a download file:

1. Open the file that you want to send to the TG2000. A sample file name is SDP2000.dnl.

2. Select one or more modules, signal sets, buttons, or signals, and choose the Delete command from the Edit menu.

3. Save the file.

To delete signals from the TG2000:

1. Display the list of TG2000 signal names.

2. Select one or more modules, signal sets, buttons, or signals, and choose the Delete command from the Edit menu. You cannot undelete.

Editing a Download File Using the Download Editor

The Download editor is used to create or modify download files (extension .dnl), which will be sent to the TG2000. Download files contain compiled signals (files with extension .cmp), which have been created by the Frame editor Build command.

Before modifying a download file, be sure you are familiar with the TG2000 operation and with the download file structure.

1. Open a download file using the Open command from the File menu. For example, open the sample file named SDP2000.dnl.

2. Use the Expand All command from the View menu to display the directory and subdirectory structure of the file (Directory, Module, Signal Set, and Button). To display signal names, click on the desired Button.

3. Perform any of the following functions, as desired:

   ■ Delete signals from the download file by selecting the signal names and choosing the Delete command from the Edit menu.

   ■ Use the Select Signal command from the File menu to Copy signals (.cmp files) from a drive.

   ■ Copy compiled signals (.cmp files) into the download file from the directory structure where the SDP2000 is stored, by selecting the signals and using the Copy and Paste commands.

   ■ Rename the download file's Signal Set, Button, or Signal names, using the Rename Selected Item command in the Edit menu.

   ■ Add new directories to the download file, using the Create DNL Directory command in the Edit menu.

Creating a New Download File

1. Choose the New command from the File menu, and specify the download file type. (Another method is to click on the download icon in the toolbar.)

2. Choose the Create DNL Directory command from the Edit menu. The Make DNL Directory dialog box appears; select Module. Use the list box to select the module for which the first module is designed (AVG1, for example). Choose OK. The new AVG1 module now appears in the left side of the download file.

3. With the AVG1 module still highlighted, choose the Create DNL Directory command again. This time, specify Signal Set. In the Directory Name box, type in any desired name (NTSC or PAL, for example). Choose OK. The new signal set now appears below the AVG1 module and indented to the right.

4. With the signal set still highlighted, choose the Create DNL Directory command again. This time, specify Button. In the Directory Name box, type in any desired name. The new button appears below the signal set, indented to the right.

5. Choose the Select Signal command in the File menu. In the Select Signal dialog box, select the drive that contains the signals that you want to add to the new file. Choose OK. Traverse the directory structure to find those signals (.cmp files).

6. Click on the desired button to display the signals on the right side of the screen. Highlight the desired signal(s) and choose Copy from the Edit menu.

7. Click on the title bar of the new download file to make it active and bring it to the front. Select the button where you want the signals to be added.

8. Choose Paste in the Edit menu. The copied signals will appear in the right side of the download file window for the selected button.

9. Choose Save As in the File menu. The download file type is automatically selected. Select the desired drive and directory to store the new download file and type in the file name. The SDP2000 automatically adds the .dnl extension.

Using the Frame Editor

This is an overview. Details are provided in the following tutorials.

1. Create a new frame file (.men extension) or open a file that you want to edit. A compiled signal has the extension .cmp. To modify a compiled signal, edit the Frame file (.men extension) by the same name.

2. Edit the file in the text mode, to provide the names of the equation files that you want to include, as well as other desired information. Code the information as indicated in *Appendix B: Field Codes*.

3. Save the file and build the frame.

4. You can display the frame graphically, and edit in the graphic view if desired. Save the file after any edits.

Editing in the Text Mode of the Frame Editor

1. To open a file in the Frame editor, click on the Frame editor icon in the Toolbar, or use the New command from the File menu, with the .men extension selected.

    Replace the text that appears between brackets <> with your information. Delete the brackets, but leave the quote marks.

2. To use an existing file, copy a .men file from the SDP2000 directory and save it under a new file name. Figure 2 shows a .men file for a software modulated signal.

    Replace existing information with new information.

3. You can have multiple frame files open at the same time, and use the Copy and Paste commands to copy lines of data between the frame files.

4. If you have several lines of similar text, such as several equations, use the Options menu to select a non-scaled font, such as Courier, to make the text line up.

5. Save the File. Proceed to *Building a Frame.*

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┌─────────────────────────────────────────────────────────────────────┐
│ ─          Tektronix SDP2000 - SMPTEBAR.MEN              ▼ ▲ │
│ File  Edit  Select  View  Communication  Options  Window  Help       │
│ ┌─┬─┬─┐ ┌─┬─┬─┬─┐ │AVG1   ±│ │NTSC SW          ±│ │░│ │░░│ │░│ │?│ │?│ │
│ ┌─────────────────────────────────────────────────────────────┬─┬─┐ │
│ │ ─                    SMPTEBAR.MEN                            ▼ ▲│ │
│ │framename:  "SMPTE 75%^Color Bars"                            ↑│ │
│ │attrib:   "RDONLY"                                             │ │
│ │comment:     ""                                                │ │
│ │                                                               │ │
│ │   include:   "..\vertint"                                     │ │
│ │   equations:  "EQN\bar75neg.eqn"   21-181  by: 2  283-445 by: 2│ │
│ │                                    547-707 by: 2  809-969 by: 2│ │
│ │   equations:  "EQN\bar75pos.eqn"   22-182  by: 2  284-444 by: 2│ │
│ │                                    546-706 by: 2  808-970 by: 2│ │
│ │   equations:  "EQN\rbbneg.eqn"    184-202  by: 2  447-465 by: 2│ │
│ │                                   708-726  by: 2  971-989 by: 2│ │
│ │   equations:  "EQN\rbbpos.eqn"    183-201  by: 2  446-464 by: 2│ │
│ │                                   709-727  by: 2  972-990 by: 2│ │
│ │   equations:  "EQN\yqineg.eqn"    204-262  by: 2  467-525 by: 2│ │
│ │                                   728-786  by: 2  991-1049 by:2│ │
│ │   equations:  "EQN\yqipos.eqn"    203-261  by: 2  466-524 by: 2│ │
│ │                                   729-787  by: 2  992-1050 by:2│ │
│ │   ENDFRAME                                                   ↓│ │
│ └─────────────────────────────────────────────────────────────┴─┘ │
│ │For Help, press F1                                               │ │
└─────────────────────────────────────────────────────────────────────┘
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Figure 2: Sample Frame File in the SDP2000 Frame Editor

Building a Frame

1. Begin with the edited frame document (.men extension) open. Save the document with a DOS file name. The SDP2000 adds the .men extension.

2. Choose Build from the File menu, or use the build icon from the toolbar. The SDP2000 automatically creates a compiled signal file with the same name as the frame file you created, except the extension is .cmp. Performing a Build automatically saves the current .men file.

3. Proceed to *Editing in the Graphic View of the Frame Editor.*

Editing in the Graphic View of the Frame Editor

The graphic view allows you to view the video frame that you have built and to make changes before sending this file to the Download editor.

1. Switch to the graphic view using the text/graphics toolbar icon, the Graphic View command from the View menu, or the keyboard shortcut, Ctrl + g.

2. A popup Field Select window appears; choose the field that you want to view. The number of fields available depends on the signal format. For example, NTSC is a four-field format. Two fields are displayed at all times.

3. Using the View menu, choose from three types of graphic views: Normal, Pulse Cross and Under Scan.

4. To edit in the graphic view, use the mouse along with the Copy and Paste commands from the Edit menu. The status bar shows the line range that you select with the mouse. Use the Tile command from the Window menu to display all open files without overlapping.

5. To open the Waveform editor for a selected line, double click on that line in the graphic view. Edit the equation file, save the equation file, and then return to the frame file for further editing.

6. After editing in the graphic view, be sure that all included .eqn files and .men files are saved, and then choose Build again.

7. To add the .cmp file to a download file, go to *Editing a Download File* on page 14.

Creating a New Waveform

It may be easiest to find an equation file (.eqn extension) that is similar to the signal you want to create, and modify the signal. This will retain the module and format information. However, you can also begin with a new file and create an entirely new signal.

To use a new file:

1. Use the Open command from the File menu, limiting the file type to .eqn files, or click on the Waveform editor icon in the toolbar.

2. Use the Module command from the Select menu to select the TG2000 module for which the new signal will be designed.

3. Use the Format command from the Select menu to select the television format to which the new signal will adhere.

4. Proceed to *Edit Equations.*

To use an existing file:

1. For help in locating a file to edit, refer to *SDP2000 File Structure.*

2. Open the equation file that you want to edit and use the Save As command from the File menu to save the file with a new name.

3. Proceed to *Edit Equations.*

Edit Equations

1. In the waveform file under edit, choose Equations from the Edit menu to display the Edit Equations dialog box.

2. For multichannel formats only:

   ■ Choose Channel to open the Select New Channel dialog box and select the channel you want to edit.

   ■ After editing one channel, choose Store Ch to save the changes you made before changing to a new channel. (If you choose Switch, it will switch to the new channel without saving the changes you made.)

   ■ Complete the following steps for each channel.

3. In the Edit Equations dialog box, choose Add. The Add Functions dialog box appears.

4. In the Add Functions dialog box, select a term that you want to add to the waveform. Use the mouse or cursor keys to move through the displayed boxes and enter the appropriate values for the selected term. Some terms require a start and stop parameter. Those terms will apply to only the portion of the waveform that you specify. A Constant term always applies to the entire waveform.

   A # sign beside a box indicates that it is a sample box, containing the number of samples equivalent to the value entered in its companion box. When you select a sample box, its companion box will appear highlighted in yellow. This indicates that a change to either box changes the value in the other box.

5. To add the selected term, choose OK. The Edit Equations dialog box reappears, and it displays a list of the term or terms that you added. As you highlight a term in this list, the values you set for the highlighted term are displayed along the right side of the window, where you can edit them.

6. If you want to add another term, repeat steps 3 through 6.

7. In the Edit Equations dialog box, choose OK if you want to view the new waveform graphically.

8. If you want to multiply the term or terms you added by a multiply function, choose Edit Equations again or double click anywhere in the waveform display to return to the editing mode.

9. Highlight the term or terms that you want to multiply in the Edit Equations dialog box and choose Multiply. The Multiply Functions dialog box appears.

10. In the Multiply Functions dialog box, highlight the term by which you want to multiply. Use the mouse or cursor keys to move through the displayed parameters for the selected multiply term, fill in the appropriate values and choose OK.

11. The Edit Equations dialog box is displayed, with the multiplier that you selected appearing as a first-level term. The term or terms it affects appear below it and indented, as second-level terms. The entire equation appears in parentheses.

    The multiplier cannot appear by itself; it must always be followed by a second-level term. If you try to cut or delete the underlying terms, an error message appears. To remove the multiplier, first copy and paste the second-level term into the equation by itself. Select the original equation (including the parentheses) and delete it.

12. If you want to multiply another term, repeat steps 10 through 12. In the Edit Equations dialog box, choose OK if you want to view the new waveform graphically.

13. If you want to apply an Other Function, choose Edit Equations again or double click anywhere in the waveform display to return to the editing mode.

14. Highlight the term or terms to which you want to apply the function, and choose Other Fxn. The Other Functions dialog box appears.

15. In the Other Functions dialog box, select the function that you want to apply. Use the mouse or cursor keys to move through the displayed parameters for the selected multiply term, fill in the appropriate values and choose OK.

16. The Edit Equations dialog box is displayed, with the other function that you selected appearing as a first-level term.

The term or terms it affects appear below it and indented, as second-level terms. The entire equations appears in parentheses.

The Other function cannot appear by itself: it must always be followed by a second-level term. If you try to cut or delete the underlying term, an error message appears. To remove the other function, first copy and paste the second-level term into the equation by itself. Next, select the original equation (including the parentheses) and delete it.

17. When editing is complete, save the equation file. Note the relative path name of the file.

18. To add the new equation to a .men file, go to *Using the Frame Editor* on page 16.

Edit Values

This is used for defining horizontal and vertical sync in digital formats.

1. Open the equation file you want to edit, or open a new equation file.

2. For multichannel formats only:

   ■ Use the Select menu to choose the channel you want to edit.

   ■ Complete the following steps for each channel that you want to edit. (After editing the first channel, go to the Select menu again and choose the next channel that you want to edit.)

3. Choose Equations from the Edit menu to display the Edit Equations dialog box. Choose Add. The Add Functions dialog box appears.

4. In the Add Functions dialog box, select Insert File. The SDP2000 creates an insert file with the same name as the equation file you are editing, except the extension is .ins.

5. Choose OK. The Edit Equations dialog box reappears. Choose OK in the Edit Equations dialog box.

6. Choose Values from the Edit menu to open the Edit Values dialog box. In the dialog box, select the sample point that you want to edit, and type in a value.

7. To change the unit of measure, choose Amplitude Units in the Options menu. (This also changes the amplitude units that are displayed along the left side of the waveform display.)

8. Choose OK in the Edit Values dialog box. The changes to the insert file are saved. The waveform display, with the new values, is displayed. To change the time units along the bottom of the display to sample units, choose Time Units from the Options menu, then select Samples.

9. If you want to remove all of the changes you made to the values, open the Edit Equations dialog box, highlight the Insert File term, and delete it.

10. When editing is complete, save the equation file. Note the relative path name of the file. This is what you will type in the frame file before you build the frame.

11. To add the new equation to a .men file, go to *Using the Frame Editor* on page 16.

Creating a New Format

To create a new format, start with an existing format, modify it and save it with a new format name. The new format can be used only with the TG2000 module selected at the time you create the new format.

Any changes you make are checked against limits for the selected module. Excessive values are highlighted for you to change. If you do not change them, they will be truncated when you save the format.

1. Click on the Format editor icon in the toolbar.

2. Select the target module from the Select menu.

3. Select an existing format from the Select menu.

4. Click in a field that you want to modify, such as sample frequency or aspect ratio. Enter the new values and press Enter. If the new value exceeds the capabilities of the target module, you are prompted to enter a new value within the module limits. Refer to the user manual for the TG2000 module to determine the limits of a parameter.

5. Save the modified format with a new name. You can modify a format that you saved previously, but not a factory format.

6. You can now select the new format in the Waveform editor or Frame editor.

Deleting a Format

All formats that you create are saved in a file named **userfmts.set**. To delete a format that you created, open **userfmts.set** in a text editor. Delete all text between the keyword **.MODULE** of the format to be deleted and .**MODULE** of the next format, and save the file.

AWVG1 Generator Module Signals

The following two signal types apply only to the AWVG1 Generator module. For more information, refer also to the *AWVG1 Wideband Video Generator User Manual*.

Zone Plate Signals (AWVG1 Generator module only). To create a zone plate signal using the SDP2000 program, do the following:

1. Select the AWVG1 module in the toolbar.

2. Open a .men file in the frame editor.

3. Select the Zone Plate Enable command from the Signal menu and ensure that it is checked (enabled).

4. Select the Zone Plate Parameters command from the Signal menu. This will open the Zone Plate Parameters dialog box. Touch HELP to open a help window that tells you how to set the parameters.

In the Zone Plate Parameters dialog box, you can choose a standard zone plate signal and modify it, or define your own signal. You can also define the size and position of the window in which the zone plate signal will appear. When you touch QUIT/SAVE, the parameters that you selected are stored in the .men file.

5. Build the frame. The graphic view will display the zone plate signal when zone plate is enabled (step 3), and Fit In Window and Normal are selected from the View menu.

6. The zone plate signal will appear within the defined window, in the graphic view of the signal. If the zone plate signal does not appear, be sure that zone plate enable is checked in the Signal menu. If you select zone plate disable, the zone plate information you stored in the .men file is still there, and will reappear when you enable the zone plate signal again.

Frequency Markers (AWVG1 Generator module only). Horizontal and field sweep signals can contain frequency markers. Horizontal sweep signals can contain variable frequency markers; field sweep signals support fixed markers only.

To set the frequency markers:

1. Select the AWVG1 module in the SDP2000 toolbar.

2. Open the .men file for a horizontal sweep signal (such as **/sdp/awvg1/525/1swp10.men**) in the frame editor.

   a. Select the Markers Enable command from the Signal menu and ensure that it is checked (markers enabled).

   b. Select the Markers Parameters command from the Signal menu. This will open the Markers Parameters dialog box.

   c. In the Markers Parameters dialog box, you can choose field or horizontal sweep. Choose horizontal sweep, and then you can set the five adjustable frequency markers.

   d. Touch HELP to open a help window that tells you how to set the parameters.

3. Field sweep signals that have frequency markers have been provided with the SDP2000 program. Open the .men file for a field sweep signal (such as **/sdp/awvg1/525/fldswp10.men**) in the frame editor.

    a. These are fixed markers. However, you can change the sweep stop frequency, which will affect the marker frequency. For example, if you start with a field sweep signal that has a 0 to 30 MHz sweep and markers at 5, 10, 15, 20, and 25 MHz, and you change the sweep stop to 6 MHz, the markers will be at 1, 2, 3, 4, and 5 MHz.

    b. Touch HELP to open a help window that tells you how to set the parameters.

NOTE. *If you want to create your own field sweep signal with markers, begin with one of the field sweep signals in the SDP2000 signal library, and change the marker frequency by modifying the related .eqn and .men files. This task requires an advanced knowledge of video signals.*

**4.** When you touch QUIT/SAVE, the parameters that you selected will be stored in the .men file.

5. Build the frame. The markers will appear within the zone plate signal. If they do not appear, be sure that markers enable is checked in the Signal menu (step a). If you select markers disable, the marker information you stored in the .men file is still there, and will reappear when you enable the markers again.

Appendix A: Remote Interface

This section describes the interfaces that can be used to transfer files from the SDP2000 to the TG2000: Serial (RS232), Parallel, and 3.5" floppy disk. Choose an interface method based on your available PC port(s).

Serial Port (RS232)

The TG2000 Serial connector is a 9-pin, D-type connector with male contacts, providing a standard RS232 interface. The location of the Serial port is shown in Figure 3. Pin assignments are listed in Table 1.
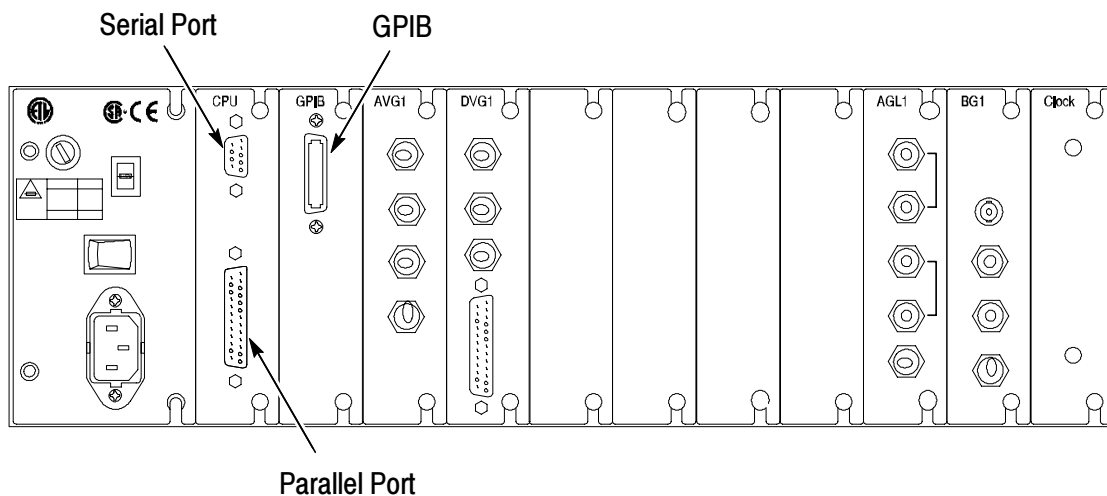
Figure 3: TG2000 rear panel, showing the communication ports

To use the Serial interface, connect the 9-pin serial/RS232 output of your PC to the 9-pin Serial connector on the rear panel of the TG2000, using a 9-pin-to-9-pin straight-through cable. Be sure that the CTS and RTS lines (pins 7 and 8 on the 9-pin serial connector) are connected. If necessary, a 25-pin connector can be used, in conjunction with a 9-pin-to-25-pin adapter (see Table 2).

From the Settings menu, choose Serial. Set the baud rate to match the TG2000, and select an available computer port for communications (COM1, COM2, COM3, or COM4). On the TG2000, set the Mode to Computer and the Flow Control to CTS/RTS.

Table 1: Pin assignments for TG2000 serial port

Pin number	Signal name
1	Chassis Ground
2	RXD (Receive Data)
3	TXD (Transmit Data)
4	Not Used
5	GND (Signal Ground)
6	DSR (Data Set Ready)
7*	RTS (Request to Send)
8*	CTS (Clear to Send)
9	Not Used

Table 2: 9-Pin-to-25-Pin Adapter Connections

DB9 pin number	TG2000 function	DB25 pin number	PC function
1	Chassis Ground		Chassis Ground
2	RXD	3	TXD
3	TXD	2	RXD
4	Not Used		
5	GND	7	GND
6	DSR	6	
7*	RTS	4	CTS
8*	CTS	5	RTS
9	Not Used		

*   **Must be connected in order to download signals.**

Parallel Port

The TG2000 parallel connector is a 25-pin connector with male contacts. The interface is Centronics compatible. The location of the parallel connector is shown in Figure 3.

To use the parallel interface, connect the 25-pin parallel output of your PC to the 25-pin PARALLEL connector on the rear panel of the TG2000, using a standard 25-pin-to-25-pin straight-through cable.

From the Settings menu, choose Parallel. Select an available port (1, 2, or 3).

GPIB Port

The TG2000 GPIB interface conforms to IEEE Std. 488.1-1987 and 488.2-1987. The location of the GPIB connector is shown in Figure 3.

To use the GPIB interface, connect a GPIB cable between your PC and the GPIB connector on the rear panel of the TG2000.

From the Settings menu, choose GPIB. Set the GPIB address to match the address for your TG2000 Platform. (On the TG2000 Platform front-panel, push the Remote button, then touch GPIB setup on the display to find the GPIB address.)

Floppy Drive

Signals from the SDP2000 can be stored on a 1.44 MB, 3.5 inch disk and transmitted to the TG2000. This may be convenient when signals are created at a central location, copied, and sent to many locations where the TG2000 is used.

The TG2000 floppy drive is shown in Figure 4.

Floppy Drive
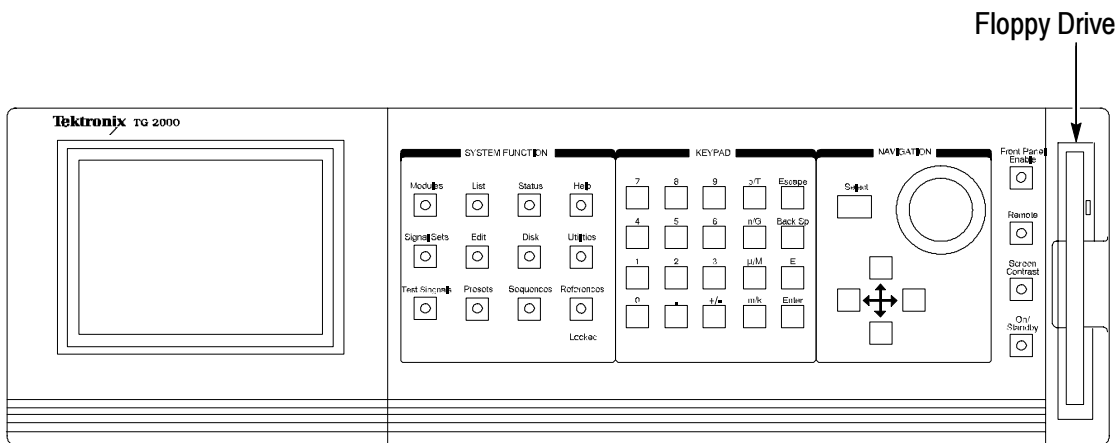
Figure 4: TG2000 front panel

Appendix B: Field Codes

Standard Fields

Framename:

Type in a name for the frame. This name will appear in the download file and on the screen of the TG2000. Type a caret symbol (^) to separate lines (similar to a carriage return). Limit the name to three lines or less. Spaces can be used.

Attrib:

Enter "RDWR" for read/write, or "RDONLY" for read only.

Comment:

Enter comments that you want to appear in the Frame editor and the Download editor. For example, in a multiburst signal, you could enter the packet frequencies. The comment will not affect the signal.

Equations:

Type in the waveform file name and the line ranges to which it applies. You can double click on any equation file name to open the waveform editor.

Additional Codes:

#

Use a # to precede each line of a comment that you want to appear in the Frame editor only. The comment will not affect the signal.

by:x

Type this code to apply the equation to the x line, and every line that is a multiple of x.

Include:

Type in the name of another .men file that you want to include. Typing in the .men extension is optional. For example: "VERTINT" or "VERTINT.MEN". Note that VERTINT could also reference another equation file, and so forth.

Format:
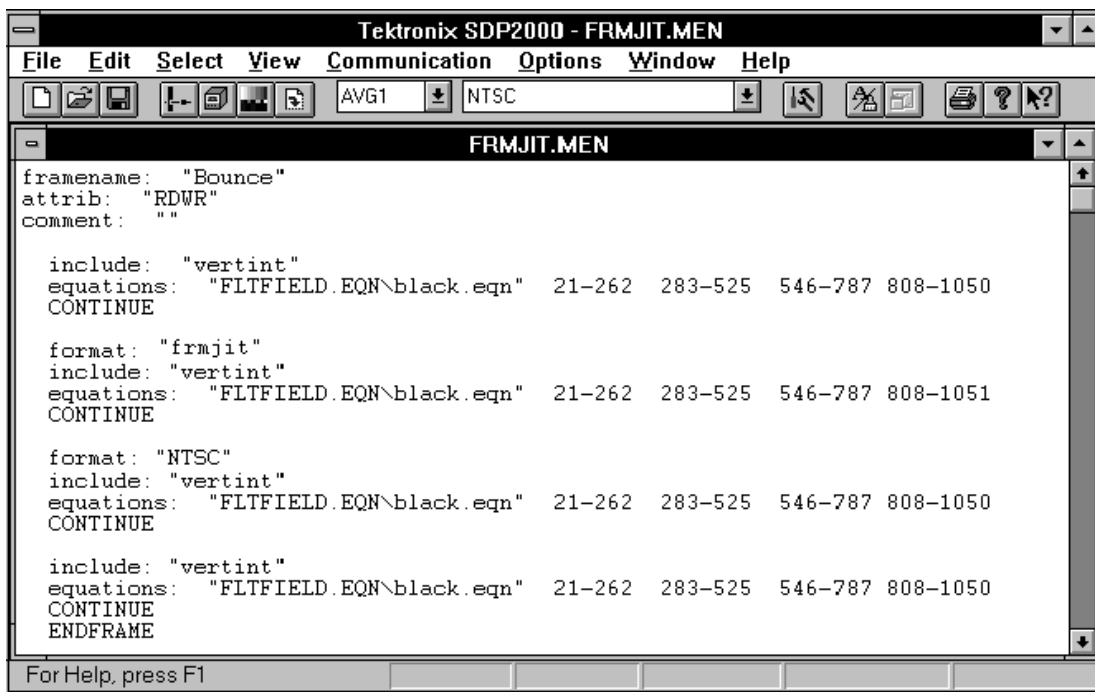
The format code is used to change the television format for one field or frame. This controls only the vertical aspect of the field or frame; the equation file controls the horizontal aspect. Figure 5 shows a sample file called \SDP2000\AVG1\SAMPLE\FRMJIT.MEN. This file uses the Format code to insert frame jitter (it inserts an extra line in one of the four frames).

ENDFRAME

All frame files must end with this code, unless they are continued to another file. If the file is continued, only the last file in the sequence must end with this code.

CONTINUE

This code is used with the ENDFRAME code for continued files. Continued frames are used to create motion. The Continue code is used in the frame file shown in Figure 5.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│ ─          Tektronix SDP2000 - FRMJIT.MEN                          ▼ ▲ │
├─────────────────────────────────────────────────────────────────────────────┤
│ File   Edit   Select   View   Communication   Options   Window   Help        │
├─────────────────────────────────────────────────────────────────────────────┤
│ □ ☞ ⊟  ┠ ⊡ ▄ ⊡  │AVG1  ▼│ │NTSC              ▼│  ⎰  ⅍ ⊡  ⎙ ? ▶? │
├─────────────────────────────────────────────────────────────────────────────┤
│ ─                          FRMJIT.MEN                               ▼ ▲ │
├─────────────────────────────────────────────────────────────────────────────┤
│ framename:  "Bounce"                                                      ▲ │
│ attrib:  "RDWR"                                                             │
│ comment:  ""                                                               │
│                                                                            │
│   include:  "vertint"                                                      │
│   equations:  "FLTFIELD.EQN\black.eqn"  21-262  283-525  546-787 808-1050  │
│   CONTINUE                                                                  │
│                                                                            │
│   format:  "frmjit"                                                        │
│   include:  "vertint"                                                      │
│   equations:  "FLTFIELD.EQN\black.eqn"  21-262  283-525  546-787 808-1051  │
│   CONTINUE                                                                  │
│                                                                            │
│   format:  "NTSC"                                                          │
│   include:  "vertint"                                                      │
│   equations:  "FLTFIELD.EQN\black.eqn"  21-262  283-525  546-787 808-1050  │
│   CONTINUE                                                                  │
│                                                                            │
│   include:  "vertint"                                                      │
│   equations:  "FLTFIELD.EQN\black.eqn"  21-262  283-525  546-787 808-1050  │
│   CONTINUE                                                                  │
│   ENDFRAME                                                                ▼ │
├─────────────────────────────────────────────────────────────────────────────┤
│ For Help, press F1                                                         │
└─────────────────────────────────────────────────────────────────────────────┘
```

Figure 5: Sample Frame File

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