User Manual

Tektronix

TekTMS
Interactive Procedure Generator
S3FT100

070-7836-02

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Preface

The TekTMS Product Family

TekTMS (of which the Interactive Procedure Generator is a part) is a family of applications for Windows 3.1. The separate modules of TekTMS (such as the Interactive Procedure Generator) are useful tools on their own, but when combined, they further enhance your total productivity.

About this Manual

This manual provides information on the installation and use of the Tektronix Interactive Procedure Generator (IPG), Version 2.5. It contains the following sections and appendices:

- Section *1,* General Information — explains what IPG is, what the IPG package includes, what additional hardware and software are necessary to run IPG, and the skills needed for its use.

- Section 2, Getting Started — explains the initialization of IPG, and provides an overview of the Windows displays.

- Section 3, Creating and Editing Test Procedures — provides step-by-step instructions for creating and editing test procedures.

- Section *4,* Menus — contains a complete listing and description of all menus, dialog boxes, edit control boxes, controls, etc..

- Section 5, Advanced Applications — provides additional information and application tutorials about features of IPG.

- Appendix A, Editing Menu Items — provides a reference list of all Edit menu items, and a description of their actions.

- Appendix *B, DEMOTEST.PRG* Program — lists the IPG test procedure contained on the program disks.

- Appendix C, *Software* Performance Report — provides a form for submitting problems encountered when using IPG.

Typographic Conventions

The following paragraphs describe the typographic conventions used in this manual:

CAPITAL LETTERS — Capital letters denote names of files (e.g., TEKTMS.EXE), environmental variables (e.g., SET), programs (e.g., LINK), macros (e.g., MAX)), and names of keyboard keys and key sequences (such as RETURN and CTRL+C). As programs are case insensitive, these names do not need to be capitalized when used in programs or as workstation entries.

CTRL+C denotes a key sequence where you hold down the first key (CTRL), then press the second key (C), then release both keys.

CTRL, C denotes a sequence where you press and release the first key (CTRL), then press and release the second key (C).

Bold Typeface — denotes on-screen items including keywords and menu commands.

Italic **Typeface** — denotes place holders in syntax descriptions. You will need to replace these place holders with specific terms or values by the user. For example, in the statement

```
GoTo name,
```

name must be replaced with a specific user supplied label name. Occasionally, an italic typeface emphasizes a word or phrase.

`Monospace Typeface` — denotes text in program listings, such as in the following listing:

```
For i=start To end Steps p Log
```

Entering Data from the Keyboard

When using the DOS operating system, examples of communication between the user and the computer appear in this manner:

```
C:\>> testprog
Enter text file name: a:\directory\test.txt
```

In this example, normal text denotes text displayed by the operating system or application program; italic text denotes text entered by the user. It is assumed that the ENTER keyboard key is to be pressed at the end of each line entered by the user.

NOTE

In a Windows environment, the ENTER keyboard key does not always terminate a text string. It often initiates a series of actions based on a group of selections made in a dialog box. Therefore, its use may have unexpected results.

IPG Terms

Names of IPG menu items are shown in bold type (such as: **Variable:, Save,** etc.). If one character of a menu item is shown underlined (such as **Actions, Operator,** etc.), you can select that item by pressing the keyboard key corresponding to that character (as well as by using the mouse). (There is one exception to this procedure: If you are selecting an item from a menu bar, you must press and hold the ALT key while you press the key corresponding to the underlined character.)

Documentation References

References to other documentation or to other portions or sections of the manual are given in italic type (such as: *Instrument Front Panel Developer Manual; Section 5, Menus;* etc.).

If the manual or portion reference occurs in the middle of an italicized note, the reference will be in normal type (as in the following example).

If **...** proceed to the System Requirements description following.

IPG Documentation

The documentation provided with IPG is as follows:

Interactive Procedure Generator User Manual (this manual)

■ Instrument Front Panel Developer Manual

Customer Service

For direct customer service concerning the IPG package:

Report Software bugs on the postpaid Software Performance Report included in Appendix C, Software Performance *Report*, of this manual.

For other assistance, contact your local Tektronix Field Office or your Sales Representative.

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Section 1
General Information

General Information

What is the Interactive Procedure Generator?

The Tektronix Interactive Procedure Generator (IPG), Version 2.5, is a Microsoft® Windows application program for creating programmable instrumentation automated test procedures. IPG operates as a component of the TekTMS suite of software. IPG features the following:

- **Compiled Code** — A translator for converting the test procedures created using IPG into the C programming language.

- **Outline View of the Test Procedure** — As each test step is created and edited, IPG displays the test procedure as an outline and generates the appropriate programming code for the instruments.

- **Context Sensitive Help** — IPG provides help menu topics for more detailed help with menu dialog boxes and instrument front panels.

- **Interactive Instrument Front Panels** — IPG uses representative or functional instrument front panels in separate, movable and sizable windows. These front panels allow you to create and edit test steps or control instruments interactively.

- **Instrument Front Panel Libraries** — Front panel libraries for VXI and GPIB instruments are available for use with IPG. For more information, contact your Tektronix Sales Representative.

- **Windows Application** — IPG uses the widely accepted Microsoft® Windows (hereafter referred to as Windows) user interface (Version 3.1 or later). Text and graphics can be imported into the procedures using the Windows clipboard application.

  Instrument Script Language — Users can develop new instrument front panel drivers or modify existing ones with the Instrument Script Language and Help Editor (explained in the Instrument Front Panel Developers Manual).

- **Procedure Flow Control** — IPG provides standard programming capabilities.

- **Variables** — IPG provides storage of procedure results for later processing or comparison. It also provides string and math functions for processing the results.

- **Interactive Adjustment Display** — Adjustment steps allow visual adjustment of a measurement in real-time.

- **Waveform Transfer, Processing, and Display** — IPG can transfer waveforms from Tektronix digitizers, store them as variables, and process them with built-in signal analysis functions.

- **Imported Displays** — Bit-mapped images created by other Windows applications (MS Paint, etc.) can be imported into IPG with the windows clipboard and displayed during test runtime.

- **Procedure Nesting** — Multiple procedures can be developed for a test program, and be called or controlled from a main procedure.

The IPG Package

The Standard Package

The standard IPG package contains the following items:

- S3FT100 Interactive Procedure Generator software on both 5.25" high density (1.2 MB) and 3.5" high density (1.44 MB) diskettes

- Interactive Procedure Generator User Manual

- Instrument Front Panel Developer User Manual (includes a Help Editor)

NOTE

For a listing and brief description of the files included on the IPG program disks, read or print out the PACKING.LST file on those disks.

System Requirements

Required Hardware

- A Tektronix VXI System Controller (includes mainframe, keyboard, display, and VXI, GPIB, RS232, and printer interfaces)

  OR

  An IBM PC-AT compatible with the following:

  - a National Instruments GPIB interface card

    at least 4 Mbyte RAM

  - one 1.2 Mbyte or 1.44 Mbyte flexible disk drive

  - at least 40 Mbyte hard disk

  - a Hercules, EGA, or VGA graphics adapter, or equivalent, and a compatible display

- A Microsoft Mouse, or equivalent MS Windows compatible mouse

- The appropriate instrumentation systems

The VXI controllers are shipped with the necessary drivers.

If you are using a non-VXI controller with GPIB instruments, you must run Windows in Standard or Enhanced mode, with the National Instruments GPIB.DLL available. If GPIB.DLL is not available, you will not be able to control GPIB instruments.

If you are using a 386 or 486 based controller, you should run Windows in Enhanced mode, using GPIB.DLL.

NOTE

When running the version of IPG that controls GPIB instruments using the National Instrument GPIB.DLL Windows interface, you should not attempt to run translated tests from the Windows DOS shell. Instead, you should exit Windows and run the translated test from DOS using GPIB.COM. You can have GPIB.COM loaded while running *GPIB.DLL* in the Windows environment, but GPIB.COM should not be used while Windows is active.

[1]The VXI System Controllers require an appropriately sized VXI Mainframe.

Optional Hardware

Any printer compatible with the Windows environment will enhance IPG by providing output listings of test procedures and instrument driver (script) files.

Required Software

8   MS-DOS Version 3.0 or later

■   Microsoft Windows Version 3.1 or later

User Requirements

To use IPG, the user needs the following skills:

■   A minimum level of knowledge about MS-DOS and its utilities

■   A familiarity with the Windows environment

■   A familiarity with the required test instruments and their interfaces

■   An understanding of the test procedures to be created, the resources needed to accomplish the test, and the ability to describe the test procedure in logical steps.

Enhanced Mode IPG

Two versions of TEKTMS.EXE are on the diskette you received. One version is for MS Windows running in standard mode and one for MS Windows in enhanced mode. The enhanced mode version is faster and should be run if your version of Windows is running in enhanced mode.

The copy of TEKTMS.EXE for standard mode can also be used in enhanced mode but it will run slower then the enhanced mode version. To determine if Windows is running in enhanced mode select the 'About program manager" menu item under the **Help** menu of the program manager. The dialog displayed will let you know if you are running in enhanced mode or standard mode. The **About** dialog will also show how much memory is available.

The enhanced mode version of TEKTMS.EXE uses a memory manager that keeps objects such as steps, variables and strings in a table or heap. To find the objects in the heap, IPG maintains an index table. Initially 2 Mbytes are allocated for the heap and 50,000 entries for the index table. These values are kept in the WIN.INI file. If these values are too small for your programs an error message is displayed by TEKTMS.EXE. If this occurs, change the entries in the WIN.INI file as described below.

Use of the WIN.INI File

TEKTMS.EXE keeps information particular to your system in the WIN.INI file. The information is kept in the "TekTMS/IPG" section of the WIN.INI file. The section begins the following line.

```
[TekTMS/IPG]
```

The TEKTMS.EXE section of the WIN.INI can have one or more entries as described below. These entries can be changed with any ASCII editor such as NOTEPAD or SYSEDIT in MS Windows.

Heapsize

The heap size is the number of bytes to be used by the TEKTMS.EXE memory manager in enhanced mode. The recommended minimum is 2 Mbytes (2,000,000.) The maximum value is 16 million minus the amount required by MS Windows. The following line specifies 3 million bytes.

```
Heapsize=3000000
```

Indexsize

The index size is the size of the index table that keeps track of where things are in the heap. It is initially set to 50 thousand entries. The recommended minimum is 10 thousand entries. The following line specifies 20 thousand entries.

```
Indexsize=20000
```

ERRORFILE

TEKTMS error messages are kept in the file TEKTMS.ERR. This entry, if present, is the path to the file. When using TEKTMS.EXE, a message saying the error file was not found, is displayed if the file is not in the current directory or with TEKTMS.EXE. The path you enter at this point is placed in this WIN.INI file entry.

As an example the following line says the TEKTMS.ERR file is located on drive D: in directory \TEKTMS\EXE.

```
ERRORFILE=D:\TEKTMS\EXE
```

Section 2
Getting Started

Getting Started

Installing TekTMS/IPG

TekTMS/IPG is quite easy to install with the supplied INSTALL Windows application. As you select from options during the INSTALL program, Help information will appear that describes the option. When prompted, any C include files should be installed into your existing C library, which is the default for INSTALL. When prompted, you should elect to overwrite exiting files, except for ISD files. Install the new ISD files in a new directory. You may need the old ISD files to run your existing test scripts.

NOTE

For information about installed files and additional product require-ments, refer to the READ.100 files on the product *disk(s).* Before installing TekTMS/RTG review, the system requirements on page 1-3. For information about file extensions used by *TekTMS/IPG* see File Names in this section.

To install the software from within the Windows Program Manager, perform the following:

1. Insert product disk number 1 into an appropriate disk drive.

2. In the **File** menu, select **Run.**

3. In the dialog box, enter the drive designator, a colon (:), and the com-mand INSTALL. If the product disk is in drive A you would enter

   `A:INSTALL`

4. The install program will prompt you for the installation location and give you status as the installation proceeds.

To install the software from the DOS prompt, perform the following:

1. Insert product disk number 1 into an appropriate disk drive.

2. At the DOS prompt, enter the drive designator, a colon (:), and the command INSTALL. If the product disk is in drive A you would enter

   `A:INSTALL`

   The INSTALL program will launch Windows and then proceed with the installation.

3. The INSTALL program will prompt you for the installation location and give you status as the installation proceeds.

File Names

When assigning file names to Test Procedures or Instrument Front Panel drivers within IPG, the user must follow the same naming conventions allowed in MS-DOS.

■ Filenames can be from a minimum of one to a maximum of eight characters long, and have an extension from one to three characters (i.e., DEMOTEST.PRG). Additional information about file name extensions is provided in the File Name Extensions description, following.

■ File names should begin with a letter from the alphabet (A–Z or a–z) and only letters and numbers (0–9).

Because IPG is often used with other software/firmware, users must ensure that filenames do not conflict.

$$\wideparen{\text{CAUTION}}$$

To avoid problems when translating IPG files into the C programming language, do not use the same name for test procedures and instrument driver files (such as *DSO2400.PRG* and *DSO2400.ISD*).

GPIB Interface Card File Name Conflicts

When using a GPIB Interface Card and its firmware in a personal computer or workstation, certain file names cannot be used for Test Procedures, or for Instrument Front Panel drivers. Should a file name conflict occur between the GPIB Interface Card software and IPG, a requested Test Procedure file or Instrument Front Panel driver file may not be generated, or IPG may "lock up" or "hang" the system.

GPIB Interface Card software uses file names such as DM5010, PS5010, etc., for GPIB devices. To display the file names used, run Wibconf. Wibconf is part of the National Instruments GPIB driver system for Windows.

File Name Extensions

File name extensions consist of a period followed by one, two, or three characters. Those used within IPG are shown in the following table.

Table 2-1: File Name Extensions

Extension	Use
.DAT	Instrument data files
.EXE	Compiled executable only files
.HLP	Instrument Front Panel help files

Table **2-1**: File Name Extensions (Cont.)

Extension	Use
.ERR	The IPG error message file
.ISB	Instrument Software Definition files in binary format
.ISD	Instrument Software Definition files
100	Read only information files about TekTMS/IPG
.PRG	IPG generated test procedure files
.TMP	Temporary files created by IPG
.BMP	Bit-mapped picture files

.TMP Files — IPG, like most Windows applications, creates temporary files during operation. These files have a tilde character (˜) in the prefix and a .TMP suffix. Do not delete these files while IPG is running or fatal errors and unpredictable results can occur. These files are automatically deleted when IPG and Windows are closed normally (exited or closed through normal menu, icon, Control Menu, or File command selections). However, if IPG closes abnormally, these files are not deleted upon closing or during a reboot. Users need to periodically find the files left after an abnormal closing and delete them to save disk space.

.TMP files are stored in a location defined by the pathname assigned to the TEMP environmental variable. If it is undefined, they are stored in the root directory of the boot drive. The DOS command format to set the TEMP environmental variable to a specific pathname is:

```
SET TEMP=<PATHNAME>
```

For example:

```
SET TEMP=C:\ TMP
```

To automatically set the TEMP environmental variable at reboot, put the command in your DOS AUTOEXEC.BAT file.

The READ.IOO File

The READ.IOO file (included on the IPG program disks) contains installation and other information about IPG. The user should read this file before install-ing the program disk files. One way to read the READ.IOO file a page at a time is to put the IPG program disk in drive A: and enter:

```
MORE < A:READ.100
```

This DOS command displays the file one page at a time. To turn the page, press any keyboard key.

Glossary of Terms

The following definitions cover terms used by Tektronix that may have a different definition than a similar term used by a different application:

- **Available Instrument Drivers** — A list of instrument drivers available for test procedure use.

- **Bus** — The communications channel used to control programmable instrumentation (VXIbus, GPIB, MXI, RS232, etc.).

- **Focus/Focused** — A concept of identifying where the current action will occur; typically identified by a dotted rectangular box or a blinking cursor. For example, if an instrument front panel Checkbox has the focus, it is surrounded by a dotted rectangular box.

- **Item** — A generic term describing the various controls that may be used in a dialog box or menu.

- **SCPI** — Standard Commands for Programmable Instruments. For further information, refer to the Standard Commands for Programmable Instruments Manual.

- **Selected Instrument Drivers** — A list of instrument drivers selected from the **Available Instrument Drivers** for a specific test procedure.

- **Test Procedure** — A single file having a collection of test steps to perform a complete test function.

- **Test Program** — A collection of test procedures.

- **Test Step** — A single step in a test procedure file.

- **View** — An instrument front panel display consisting of a graphical representation of controls, such as pushbuttons, check boxes, displays, etc.

Definition of Programming Elements

This defines the data elements used in creating a program. Many of the programming constructs are built from these fundamental elements. Operators are the instructions for combining elements to construct totals or larger elements. You can write subprograms to provide any operator that is not included in IPG.

Expressions

An expression is created from one or more of the elements that have a value combined to represent a new combined value. Another way of explaining an expression is to describe it as one side of an algebraic formula. Some examples of the components that make up an expression and some expressions follow:

```
constants:    3    5.0    "start"
variables:    dmmReading$    CalFactor    count&
functions:    val() TAN() UCASE$() fmtflt$() timer()
operators:    +    -    ()    AND    ^

expressions: count*sqr(val(dmmReading$)-CalFactor))
             fail1 AND fail2 AND fail3
             "Answer is"+str$(TAN(val(dmmReading$)*1.3))
                                            +"Radians"
             12
```

Several things to note about expressions are:

Expressions can be very simple (one element) or extremely complicated.

- Usually, all values are separated from each other by an operator.

  Using meaningful names makes the expression much easier to under-stand.

- Values can be of different types, and the proper combination of these types is necessary for correct results.

- Data suffixes are used to make the data type of a value more obvious.

Constants

Constants (sometimes referred to as scalar values) do not vary in value once assigned.

Numeric Constants — Numeric constants are numbers. IPG recognizes two types, Integer and Float.

Integers are 32-bit whole numbers in the range 2,147,483,648 to −2,147,483,647 (inclusive).

Floats are numbers containing fractional parts. They are 64-bit numbers in one of the following forms:

sd...d	implied decimal; unscaled
sd...drd...d	explicit decimal; unscaled
sd...drd...dEsd...d	explicit decimal; scaled
d...dEsd...d	implied decimal; scaled

where s = sign (+ or −), d = digit (0−9), ... = repeated digits, r = decimal point (ASCII 46), E or e = explicit E or e

String Constants — String constants (sometimes referred to as string literals, literals, or just strings) are a sequence of ASCII characters enclosed in double quotation marks (" "), such as:

```
"this is a string constant."
```

Variables

Variables are names chosen to represent values used in an IPG test procedure. The value of the variable may be assigned specifically, or result from the execution of the test procedure.

The first character of a variable name must be alphabetic. All characters after the first one can be alphanumeric or a period (ASCII 46).

The length of a variable name is limited only by the amount of memory available; however, variable names must be unique within the first 32 characters.

Variables may represent Integers, Floats, Strings, or Waveforms as determined by the data-type suffix symbol (see the Data Type *Suffix* description) appended to its name. If a data type suffix is not appended to a variable, the default data type is Float.

There are two types of variables, local variables and global variables. Global variables must be defined by adding them to the Global Variables window. Local variables are defined only with in a single PRG file. If the variable "i&" is assigned the value 322 in test "A.PRG" and "A.PRG" calls test "B.PRG", the first reference to "i&" in "B.PRG" results in the error message 'Attempt to use uninitialized variable." Where as, if you define "i&" as global variable the first reference in "B.PRG" would return the desired value, 322.

The TekTMS system defines a global variable named "PassFail." Its use is reserved for future release of the TekTMS system. You should avoid using "PassFail" as a variable name since it may cause conflicts with future releases.

Arrays

An array is a group of variables of the same type that can be used with an index to shorten a program procedure. Before using an array name, you must define its size. This definition is done using the **Dimension...** menu item from the Actions Menu. An example of the use of an array follows:

```
DIMENSION results[10]

FOR count = 1 TO 10 STEPS 10 LINEAR
REMARK A measurement step to put a value in one of the
       array elements.
results[count] = dmm voltage reading
NEXT
```

For the programmer's convenience, the storage is reserved for the requested number of elements plus 1. This convention allows the programmer in the above example to address either the elements 0–9 or (as chosen in the example) 1–10, whichever is more natural to the application program.

- Only one-dimensional arrays are allowed.

  Arrays can be floating, integer, or string types.

- An array element can be used wherever a single variable can be used.

- A complete array, (that is, the array name without a specification of a single element) can not be used in expressions or as a parameter of a subroutine.

Functions

Functions are built in procedures that create a value. They may optionally use values that are supplied as inputs. Functions that return values that are strings must be marked with the $ data suffix.

Common Functions — The functions in the following list are supported by IPG. All trigonometric functions use radians as the unit of measure.

- **ABS(n)** — Returns the absolute value of n.

- **ASC(s$)** — Returns the ASCII numeric value for the characters$.

- **ATN(n)** — Returns the arc tangent of n.

- **CHR$(n)** — Returns the ASCII character represented by n.

- **CINT(n)** — Converts n to an integer (rounds).

- **COS(n)** — Returns the cosine of n.

- **DATE$()** — Returns the current system date.

- **EOF(n)** — True if the last read of file n was at the end of the file.

- **EXP(n)** — Returns a value of e^n.

FIX(n) — Converts n to an integer (truncates any fractional part; e.g., 1.4 or 1.6 truncate to 1, while −1.4 or −1.6 truncate to −1).

■ **HEX$(n)** — Converts n to a hexadecimal value.

■ **INT(n)** — Converts n to an integer (selects the largest integer that is ≤ n; e.g., 1.4 or 1.6 convert to 1, while −1.4 or −1.6 convert to −2).

■ **LCASE$(s$)** — Converts all characters in *s$* to lowercase

■ **LEFT$(s$,n)** — Extracts the left n characters from *s$*.

■ **LEN(s$)** — Returns the length of *s$*.

■ **LOG(n)** — Returns the natural logarithm (power of e) of n.

■ **LTRIM$(s$)** — Removes any leading spaces (from the left side) in *s$*.

■ **MID$(s$,n,m)** — Extracts a substring of m characters from *s$*, starting at the nth character.

■ **MOD(n,m)** — Return the modulo value (remainder) of n divided by m.

■ **OCT$(n)** — Converts n to an octal value.

■ **RIGHT$(s$,n)** — Extracts the rightmost n characters from *s$*.

■ **RND(n)** — Generates a random number between 0 and 1. When n = 0, the generator returns the next random number from a sequence generated from a single seed and 0 is returned; when n >0, the generator is seeded with a random seed; when n <0, the generator is seeded with a fixed seed resulting in a repeatable sequence of random numbers and 0 is returned.

■ **RTRIM$(s$)** — Removes any trailing spaces (from the right side) in *s$*.

■ **SGN(n)** — Returns a value defining the sign of n (1 indicates positive, 0 indicates 0, and −1 indicates negative).

■ **SIN(n)** — Returns the sine of n.

■ **SPACE$(n)** — Creates a string of n spaces.

■ **SQR(n)** — Returns the square root of n.

■ **STR$(n)** — Returns the string representation of n.

■ **STRING$(m,n)** — Creates a string of length m by repeating the charactern, where n is the ASCII character code of the desired character.

■ **TAN(n)** — Returns the tangent of n.

■ **TIME$()** — Returns the current system time.

■ **TIMER()** — Returns the number of seconds since system startup.

■ **UCASE$(s$)** — Coverts all characters in *s$* to uppercase.

■ **VAL(s$)** — Returns the numeric value of *s$*.

IPG Special Functions — IPG provides a number of string functions that help you produce test reports. These functions format floating point and string data into fixed width fields that can be combined and output to a report file, a printer, or an operator display.

The first parameter in each function establishes the field width in characters that the converted value cannot exceed. If the input value is too large for the specified width, the field is filled with asterisks (*) to indicate that the value overflowed the field. A field width of zero (0) causes an error message to be generated and the test execution to stop whenever the test is run.

Floating Point Functions — The following functions convert floating point expressions into fixed width strings. When the width parameter is a positive value, the converted value is right justified in the field; when the width parameter is a negative value, the converted value is left justified.

■ **fmtfix$(width, precision, value)** — This function converts floating point values to strings with an embedded decimal point. The precision parameter specifies the number of characters displayed to the right of a decimal point. A negative precision value will generate an error message. If precision is zero, no decimal point is displayed. If the value cannot be converted to a fixed-point string within the given width, an exponential form is tried. If this also fails, the field is filled with asterisks (*).

The following examples show the results of using the function.

String Expression	Displayed Result
":"+fmtfix$(10,3,1.0)+":"	: 1.000:
":"+fmtfix$(10,3,-1.2345)+":"	: -1.235:
":"+fmtfix$(10,3,1234567890123.0)+":"	:1.235E+012:
":"+fmtfix$(-10,1,1.0)+":"	:1.0 :
":"+fmtfix$(3,1,-100.23)+":"	:***:

■ **fmtexp$(width, precision, value)** — This function converts floating point values into exponential strings. If the string does not fit within the width specified, the field is filled with asterisks (*). The precision parameter specifies the maximum number of digits displayed to the right of the decimal point excluding the exponential suffix (e.g., E+123). A negative precision value will generate an error message. When precision is zero, no decimal point is displayed. The displayed value is rounded to the specified precision.

The following examples show the results of using the function.

String Expression	Displayed Result
`":"+fmtexp$(12,3,1.0)+":"`	`:  1.000E+000:`
`":"+fmtexp$(-12,3,1.0)+":"`	`:1.000E+000":`
`"+fmtexp$(12,3,123.4567)+":"`	`:  1.235E+002:`
`":"+fmtexp$(5,3,12345.67)+":"`	`:*****:`

■ **fmtflt$(width, precision, value)** — This function converts floating point values into strings. The resulting string is in either the *fmtexp$()* or *fmtflt$()* format, whichever is shortest. When *width* is negative, the result is left justified; when *width* is positive, the result is right justified. *Precision* specifies the number of significant digits (excluding leading 0's to the left of the decimal point and trailing 0's to the right of the decimal point). If the converted value is too large for the specified *width,* the field is filled with asterisks (*). See *fmtexp$()* and *fmtflt$()* for examples of the resulting strings.

The following examples show the results of using the function.

String Expression	Displayed Result
`":"+fmtflt$(10,2,123.456)+":"`	`:       120:`
`":"+fmtflt$(10,7,123.456)+":"`	`:   123.456:`
`":"+fmtflt$(10,6,123.456)+":"`	`:   123.456:`
`":"+fmtflt$(10,2,1234.56)+":"`	`:   1.2E+003:`
`":"+fmtflt$(7,2,123.456)+":"`	`:*******:`
`":"+fmtflt$(10,0,1234.56)+":"`	`:     1E+003:`

■ **fmtint$(width, minwidth, value)** — This function converts a numeric value into an integer value. If the numeric value is a floating point value, it is rounded to an integer before conversion. If the value is too large to be represented as an integer, the field is filled with asterisks (*). The parameter *minwidth* specifies the minimum number of digits displayed. When the value has fewer digits then *minwidth,* leading zeros are added. When *width* is negative, the result is left justified; when *width* is positive, the result is right justified. The output is always at least one digit. Negative *minwidth* values are ignored.

The following examples show the results of using the function.

String Expression	Displayed Result
":"+fmtint$(8,1,45)+":"	: 45:
":"+fmtint$(8,3,45)+":"	: 045:
":"+fmtint$(8,0,45)+":"	: 45:
":"+fmtint$(-8,0,45)+":"	:45 :
":"+fmtint$(8,0,1E90)+":"	:********:

NOTE

Justification for string functions is just the opposite of that for the floating point functions. When the width parameter is a positive value, the converted value is left justified in the field; when the width parameter is a negative value, the converted value is right justified.

String Functions —

- **fmtstr$(width, string)** — This function places a string in a fixed-width field. If the string is too large for the field, only the left most width number of characters is used. A width of zero (0) will generate an error message. The following examples show the results of using the function.

String Expression	Displayed Result
":"+fmtstr$(5,"ABCDEFGHIJKL")+":"	:ABCDE:
":"+fmtstr$(5,"ABC")+":"	:ABC :
":"+fmtstr$(-5,"ABC")+":"	: ABC:

Operators

IPG supports several classes of operators.

Arithmetic Operators — Arithmetic operators perform the commonly understood arithmetic operations. These operators are:

+ addition

– subtraction

* multiplication

/ division

^ exponentiation

Logical Operators — Logical operators provide the capability to combine values according to the commonly accepted definitions for logic operators. The operators are: AND, OR, and NOT. Following are the truth tables for these operators:

AND Truth Table			OR Truth Table			NOT Truth Table	
x	y	x AND y	x	Y	x OR y	x	NOT x
1	1	1	1	1	1	1	0
1	0	0	1	0	1	0	1
0	1	0	0	1	1		
0	0	0	0	0	0		

Relational Operators —

Relational operators compare two values and create a value of one (1) or zero (0) to represent TRUE (1) or FALSE (0). These operators are:

    =   equal

    <   less than

    >   greater than

    <>   not equal

    <=   less than or equal

    >=   greater than or equal

String Operators — String operators act on two strings. The only operator supported by IPG is concatenation, which creates a string consisting that consists of the first string followed by the second string. Functions are provided to perform other operations on strings. The symbol for the concatenation operator is the + symbol. IPG determines from the context whether the + stands for arithmetic plus or concatenation. If the context is not clear, you have created an invalid expression and IPG will notify you with an error message.

Data Type Suffixes

IPG supports the following data type suffixes for variables (default when no suffix is used is Float):

- \# Float
- & Integer
- $ String
- - Waveform

Float

Float data is a 64-bit numeric value as defined in ANSI X3.42-1975 for an NR2 or NR3 numeric representation. The range is $-.7976931348623158E+308$ to $1.7976931348623158E+308$. See the previously explained Numeric Constant topic for its form.

Integer

Integer data is a 32-bit numeric value as defined in ANSI X3.42-1975 for an *NR1* numeric representation. See the previously explained Numeric Constant topic for its range.

String

String data is sequential ASCII characters enclosed in double quotation marks (" "). See the previously described String Constant topic for its form. The maximum length is limited to the amount of free memory (RAM).

Waveform

Waveform data is Tektronix defined data packages that include a description of the data along with the data itself. IPG includes the routine(s) required to convert waveform data from Tektronix devices for IPG use. The maximum size of a waveform for display is limited to the amount of free disk space. The maximum size of a waveform that can be analyzed with Pulse Parameter functions is 16K (16288). When transferred to a file, the waveform data is written in Analog Data Information Format (ADIF) 1.0 (also called SCPI 1992.0).

Numeric Terms

Numeric terms must adhere to the following definition:

```
NUMERIC TERM ::=  NUMERIC CONSTANT | NUMERIC VARIABLE |
NUMERIC EXPRESSION
```

NUMERIC CONSTANT ::= See the previously explained *Numeric* Constant topic

NUMERIC VARIABLE ::= an integer or float variable

NUMERIC EXPRESSION ::= an expression that evaluates to a `Numeric Constant`

Data File Format

The format of data files associated with file transfers by IPG follow rules similar to BASIC language READs and WRITEs.

When IPG writes to a file (Transfers to a File), the following rules apply:

- Strings are terminated with a CRLF (Carriage Return, Line Feed)

- Each numeric value is converted to its ASCII value, written to the file, and terminated with a CRLF. This essentially places each numeric value on a separate line.

You must also follow these rules for files created to be read by IPG.

The exception to the described data transfers takes place during instrument input/output. During data transfer to and from an instrument, the entire file is read from or written to the instrument (from the beginning) at one time, with the file being opened and closed at each transfer. The format of the file is dependent upon the instrument that you are communicating with.

ASCII Log File Format

ASCII log files are intended to be read by users. Every time a logfile is opened a header is written to it. The header includes the filename, a blank line, the date, and a column header with the names of the items written out to the log file. These items are:

- sequence number — a number that identifies this log entry. The value is incremented with each log entry and not reset for each test.

- time of day — in hours, minutes, and seconds, surrounded by double quotes.

- low value — the lowest measured value that will yield a PASS.

- nominal value — the expected or target value.

- high value — the highest measured value that will result in a PASS.

- actual value — usually the actual measured value.

- **PASS/LOW/HIGH indicator** — "PASS" if the actual value is between the low value and the high value. "HIGH" if the actual value is greater than the high value and "LOW" if the actual value is less than the low value.

- **comment** — a string surrounded by double quotes, used to annotate the log entry.

As an example the following log file has three entries the first passed the second was low and the third was high.

```
10/22/91

                    LOW   NOMINAL HIGH   ACTUAL   PASS/FAIL

4873 16:52:26  4000   5000    6000    5010     PASS no comment

4875 16:52:27  4000   5000    6000    3700     LOW   no comment

4877 16:52:28  4000   5000    6000    7890     HIGH no comment
```

SV Log File Format

CSV or Comma Separated Value files are intended for use with other programs, such as spread sheets or data base programs. CSV Log files can be read with the INPUT step as a sequential file.

A CSV log file contains one line for each PRINT CSV LOG step that was executed. A line in a CSV log file contains seven fields that are separated by commas. The fields are:

- **sequence number** — a number that identifies this log entry. The value is incremented with each log entry and not reset for each test.

- **time of day** — in hours minutes and seconds, surrounded by double quotes.

- **low value** — the lowest measured value that will yield a PASS.

- **nominal value** — the expected or target value.

- **high value** — the highest measured value that will result in a PASS.

- **actual value** — usually the actual measured value.

- **PASS/LOW/HIGH indicator** — "PASS" if the actual value is between the low value and the high value. "HIGH" if the actual value is greater than the high value and "LOW" if the actual value is less than the low value.

- **comment** — a string surrounded by double quotes, used to annotate the log entry.

As an example the following file has two entries the first for a measurement that passed and the second for one that failed.

```
"17:19:41",1,500,1000,501.34,"PASS","Its well within range"

"17:19:41",1,500,1000,-1,"LOW","woo! its negative"
```

The two times are the same because booth entries were made within a second of each other.

We recommend that name of CSV log files have a type field of CSV. The about log file might be named EXAMPLE.CSV.

Sequential File Format

Sequential files are created by PRINT steps and can be read by INPUT steps. Each record of a sequential file is a string of characters terminated by a carriage-return-line-feed sequence. The characters in the record can be any byte value from zero (0) to and 255 inclusive.

Sequential files can be used for a wide variety of purpose including reports, data logging, printing labels, and just about anything that uses strings of characters. Both the ASCII and CSV log files are variants of sequential files and can be read as sequential files.

Initializing IPG

The following assumes that Windows and a mouse are installed and fully operational.

To initialize IPG, perform the following:

1. At the DOS prompt, enter the Windows environment.

2. When the Program Manager appears: point to the drive icon where IPG is located and click the mouse, then select Restore from the menu that will appear (or you can double-click the mouse on the icon to bypass using Restore); select from the File Menu and enter the path for IPG in the edit control box, then select the pushbutton; or open the TEKTMS.EXE file through the Windows File Manager.

The IPG Main Menu window (shown in the following illustration) will then appear. You are now ready to create a test procedure. However, before beginning, you may want to maximize the IPG window (as shown in the illustration). At this point, you can review the following section on IPG Display Familiarization or continue to Section 3, Creating and Editing a Test Procedure.

```
┌────────────────────────────────────────────────────────────┬──────┐
│ ▬              TekTMS/IPG – (untitled)                      │ ▼│▲ │
├────────────────────────────────────────────────────────────┴──────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options  Translate │
│                                                              F1=Help │
├────────────────────────────────────────────────────────────────────┤
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
└────────────────────────────────────────────────────────────────────┘
```
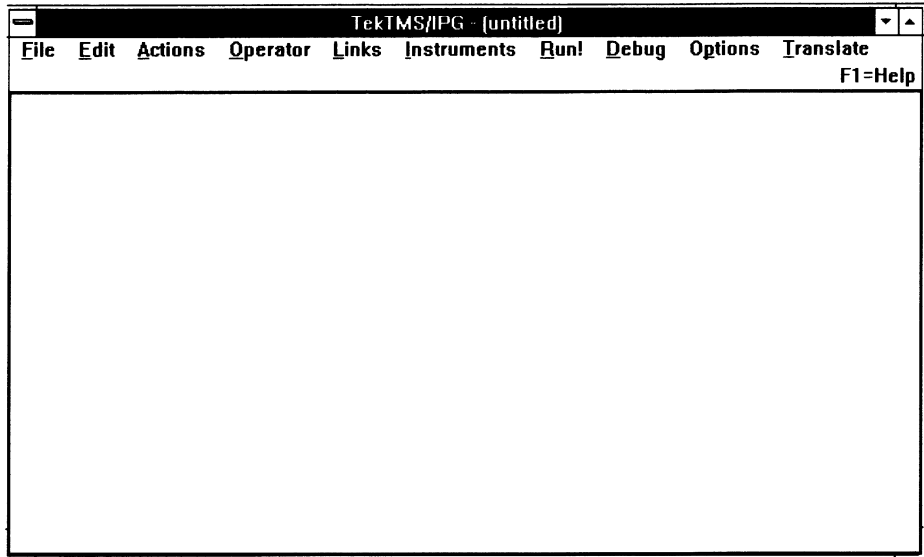
IPG Display Familiarization

Since IPG displays can be described in standard Windows terms, the following example IPG displays are shown with a description of some common items.

IPG Main Menu with Sample Menu

The following illustration shows the IPG Main Menu with its Actions Menu selected (captions have been added to refer you to the definitions following the illustration — these captions are not part of the normal display). It is a typical Windows display showing a submenu **(Actions)** selected. To obtain this display, select the **Actions** menu item from the Main Menu by pointing to it and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the "A" keyboard key. To display a different menu, repeat the sequence for the menu you want to see. (Each menu has an underlined character in its name. This character designates the keyboard key to press if you wish to call the menu with the keyboard keys, rather than the mouse.) To remove a menu, point to the white space in the work area and click the mouse.

```
MENU BAR ──────▶  ┌─────────────────────────────────────────────────────────────────────┐
                  │  ─                    TekTMS/IPG - (untitled)                        │
                  │  File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options
                  │  Translate    Calculate...          If Then Else...            F1=Help
                  │               Dimension...          While Do...
                  │               Pulse Parameters...   For Next          ▶
                  │               Transfer Data      ▶  Exit For Next...
                  │               File I/O           ▶
                  │               On Event...           Call procedure    ▶
MENU              │               On Abort...           Exit Procedure...
ITEMS             │               Delay...              Stop Test...
                  │               Remark...             Gosub...
                  │               Include          (▶)  Return...
                  │                                     Goto...
                  └─────────────────────────────────────────────────────────────────────┘
                              MENU                    MENU ITEM
                              ITEM                    ELLIPSIS
                             ARROW
```
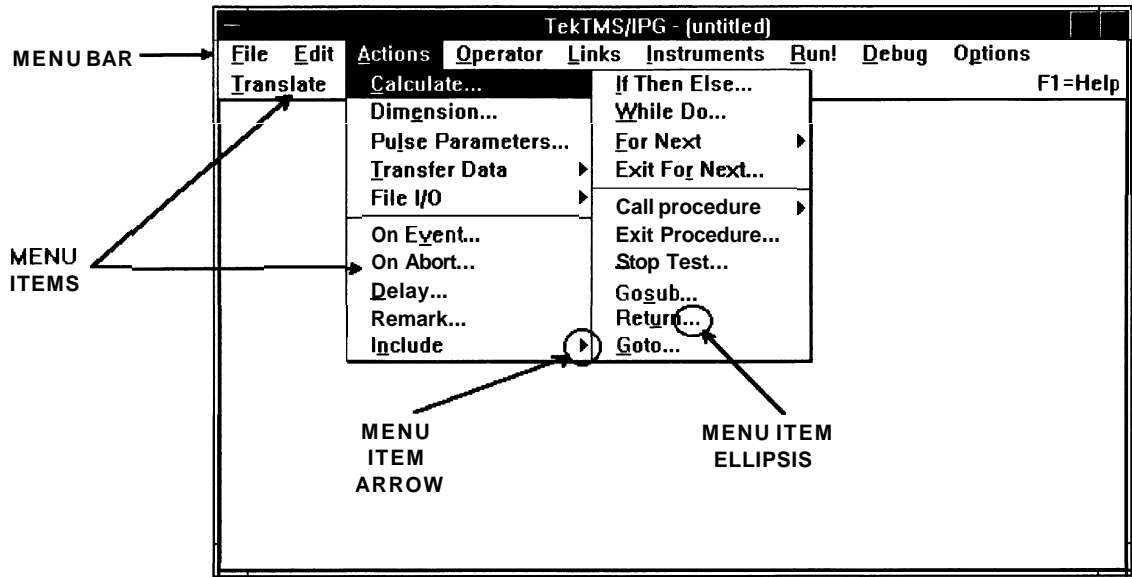
- **MENU BAR** — a horizontal bar that contains the names of other menus you can access.

- **MENU ITEM** — a word or phrase that you select to carry out an action.

- **MENU ITEM ARROW** — designates that you will see another menu when you select the menu item preceding it.

- **MENU ITEM ELLIPSIS** — designates that you will see a dialog box when you select the menu item preceding it.

IPG Dialog Box

The following illustration shows an IPG dialog box selected through the Instruments Menu. To display it, select **Actions** from the Main Menu. When the Instruments Menu appears, select **On Event....** To implement the actions associated with entries in a dialog box, select the **OK** pushbutton. To exit the dialog box without implementing any action, select the **CANCEL** pushbutton, or press the ESC keyboard key.
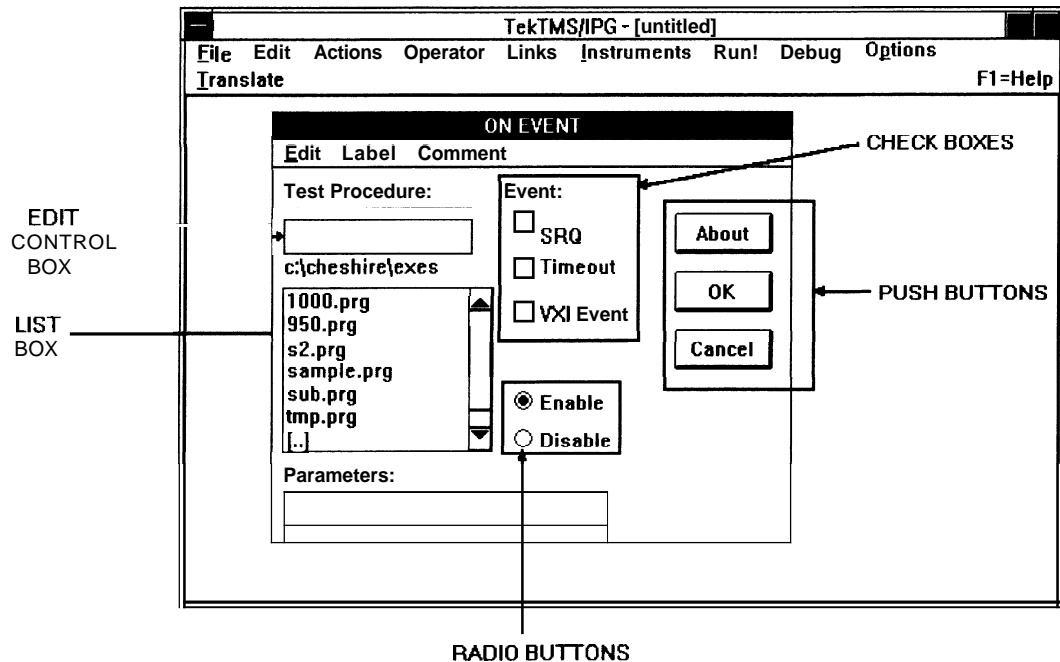
- **EDIT CONTROL BOX** — a box for entering or editing information. It may be empty when the dialog box appears, or it may contain a default entry. Edit control boxes typically have names followed by a colon (:).

- **LISTBOX** — an item in a dialog box containing a list of available choices, such as disk drives, directories, test instrument data, etc. You can select items in a list box, but you can not edit them, unless they were placed in the ListBox through an Edit Control Box. In this case, you can edit the Edit Control Box entry, which will change that entry in the ListBox.

  Brackets ([ ]) delimit disk drives and directories, and hyphens (-) further delimit disk drives from directories. For example, [-a-] denotes a disk drive and [library] denotes a directory. A [..] denotes the next higher directory from the current directory. A list box may initially be empty until you make an entry in an Edit Control Box, or perform some other action.

- **CHECKBOXES** — options in a dialog box that can be individually turned on or off. One or more of these options can be turned on or off simultaneously.

- **PUSHBUTTONS** — command buttons in a dialog box labeled to indicate what they do when you select them.

- **RADIOBUTTONS** — mutually exclusive options in a dialog box, of which only one can be turned on at any one time. Selection of one radiobutton cancels the selection of a previous radiobutton.

IPG Global Variables Window

The following illustration shows the IPG global variable window. Use this window to manipulate the list of global variables. Variables can be added or deleted to the list through this window. The window has two main components, the list of variables and a menu. The list of variables always contains at least one entry, *PassFail*.
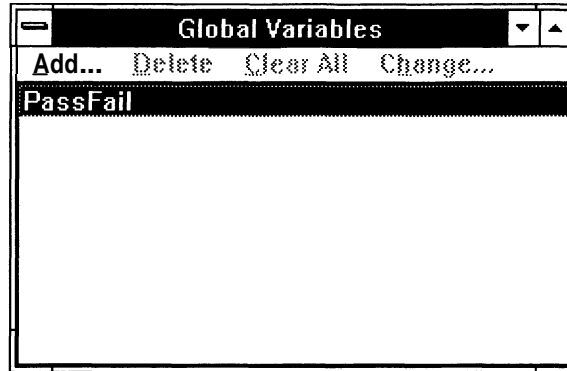
Add... — Select Add**...** to add a variable to the list of global variables. The following dialog will then appear.
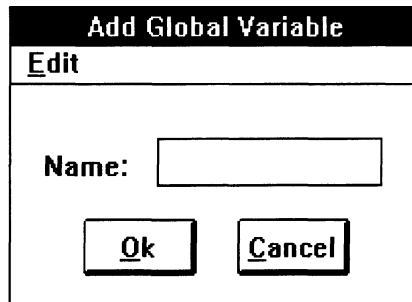
- Name — is an edit box. Enter the name of the global variable in this edit box. If the variable is an array, include the number of entries just as you would in a dimension step.

- **Ok** — a pushbutton. Press **Ok** to add to the list of global variables.

  Cancel — a pushbutton. Press Cancel to close the dialog box without adding anything to the list of global variables.

Delete — Select Delete to delete the selected ListBox item from the list.

Clear All — The Clear All list item removes all the global variable names from the list box, except for "PassFail."

Change — Select **Change** to display a dialog that allows you to change the currently selected global variable. The dialog looks and performs the same as the **Add** dialog. Changing a global variable in this manner only changes it in the global variable list box. It does not change where the variable is used within a test.

Section 3
Creating and Editing
Test Procedures

Creating and Editing Test Procedures

This section contains a step-by-step tutorials for creating and editing simple test procedures. The instrument drivers and picture files needed to create the procedures are provided on the IPG program disks. Instrument drivers for the various test instruments must be selected from the Tektronix Instrument Front Panel Libraries, or written (refer to the Instrument Front Panel Developers Manual for further information). The IPG program disks contain a program file (DEMOTEST.PRG) of a sample test procedure. That procedure is more complex than the procedures covered in the section. You may want to work with that procedure after you have become accustomed to simpler procedures presented here. Refer to Section 6, Advanced Applications, for a tutorial on the DEMOTEST.PRG procedure.

NOTE

The creation of the test procedures also gives instruction on how to run them. If you wish to try running the procedures in the Single Step mode, refer to the Debug Menu description (Section 4, Menus) for further information.

Test Procedure Overview

Assumptions

For those users who intend to perform the steps in these tutorials, the following assumptions have been made:

- All IPG and Windows files are loaded onto the appropriate disk drives and directories.

- IPG is running in a Windows environment.

- A Tektronix 2400 Series Digital Sampling Oscilloscope (with the necessary GPIB cabling to your controller) is available for use in two of the following tutorials. (If this oscilloscope is not available, you may still continue with the tutorials: information is provided on emulating the nonexistent instrument for the fourth tutorial, and, although you will not be able to run the fifth tutorial, you can still create it.)

Software

The following instrument driver and bit-mapped picture files are used only in the creation of the tutorial test procedures. They are included on the IPG program disks, and should already be resident in the directory where the test procedure is to be stored.

> 2400DSO.ISD
> TEKWAVE.WFD
> TEKPIC.BMP

NOTE

IPG does not keep track of the directory pathnames for files used in the test procedure (files with extensions such as *.ISD, .BMP,* etc.); therefore, those files must be resident in the directory where the test procedure file is stored.

Creating Test Procedures

Screen displays are shown at key places in the following tutorials. However, not all displays that occur are shown. If your displays do not match the illustrations, either do minor editing as explained below, or select the Cancel pushbutton on your display and start the tutorial step over.

Since editing a procedure is not explained until the latter part of this section, and because there are many editing options, the following instructions on how to do minor editing should suffice to get you through creation of the sample test procedures:

If you select the wrong item from a menu, simply move the cursor onto the white space in the display and click the mouse to return to the Main Menu.

If your selection of a wrong item causes a dialog box to appear, select the Cancel pushbutton from that dialog box to return to the Main Menu, then begin the step again.

■ If you are in a dialog box and make an error in selecting a radiobutton or a list box, simply select the correct radiobutton or list box choice.

■ If you make an error in a check box, continually select the check box until the " X appears or disappears depending on the condition required.

■ If you enter the wrong text in an edit box, use the BACKSPACE, DEL, or directional arrow keys to correct it.

■ If you select an **OK** pushbutton and created a wrong or unwanted step, note the error and continue creating the procedure. When you have finished the procedure, use the tutorial information in Editing a Test Procedure, in the second half of this section, to delete the unwanted step.

NOTE

In the following tutorials, when you are told to select an item, you can select that item by pointing and clicking the mouse on it. Some of the items have an underlined character in their names. You can select these items from a menu list not only with the mouse, but also by pressing the keyboard key corresponding to the underlined character. To select these items from a menu bar, press and hold the ALT key while pressing the key corresponding to the underlined *character.*

Test Procedure Number 1

In this tutorial we will learn how IPG communicates with the operator, and give an example of the use of math and string functions. The following test procedure will prompt the operator for a number, then perform a math function on that number and display the result.

Perform the following to create this procedure:

1. Initialize IPG and display the Main Menu. Select **File**, causing the File Menu (shown in the following illustration) to appear.
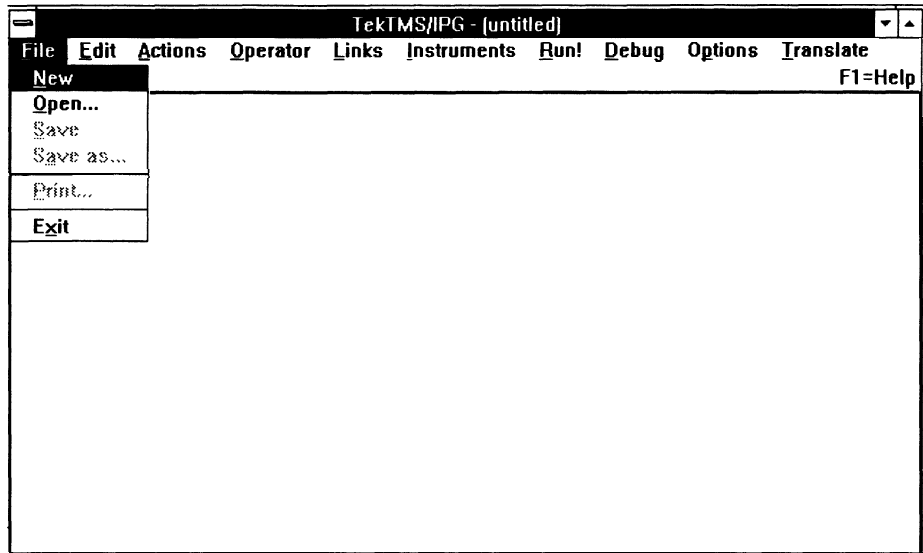
2. Select **New.** This will cause IPG to open a blank file and return to the main menu.

3. Select **Qperator,** causing the Operator Menu (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                   TekTMS/IPG - (untitled)                    ╔╗╤╗  │
│ File   Edit   Actions  │Operator│  Links   Instruments   Run!   Debug   Options │
│ Translate              │Adjustment...        │                         F1=Help  │
│                        │Display XYPlot...     │                                  │
│                        │Display Waveforms...  │                                  │
│                        │Display Data        ▶ │                                  │
│                        │Prompt              ▶ │                                  │
│                        └──────────────────────┘                                 │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
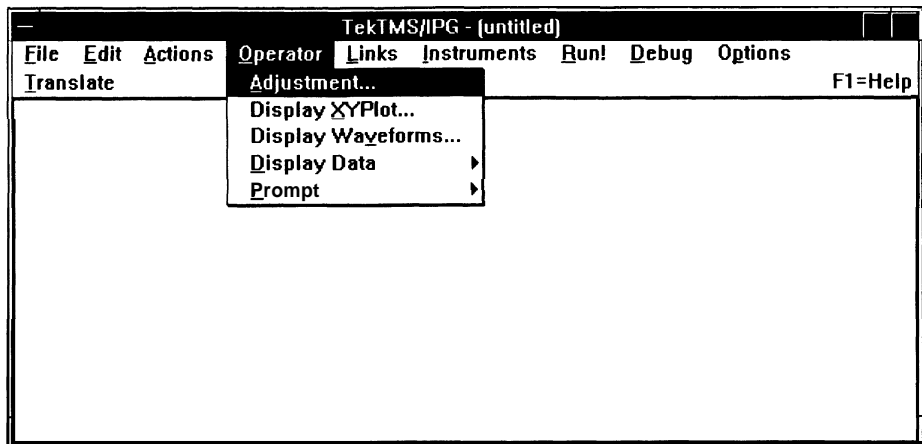
4. Select **prompt,** causing the Prompt Menu (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬                   TekTMS/IPG - (untitled)                      ▼ ▲  │
│ File   Edit   Actions  │Operator│  Links   Instruments   Run!   Debug   Options   Translate │
│                        │Adjustment..          │                       FI=Help  │
│                        │Display XYPlot..       │                                │
│                        │Display Waveforms...   │                                │
│                        │Display Data         ▶ │                                │
│                        │Prompt                 │ ┌────────────┐                 │
│                        └───────────────────────┘ │Text...     │                 │
│                                                   │Picture...  │                 │
│                                                   └────────────┘                 │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
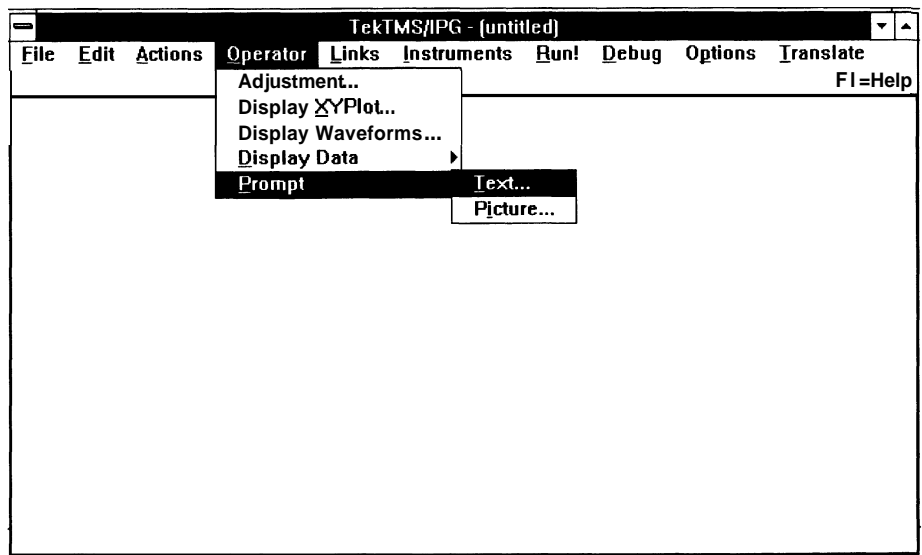
5. Select **Text...**, causing the Text Prompt dialog box (shown in the following illustration) to appear.

```
┌──────────────────────────────────────────────────────────────────────┐
│                            TEXT PROMPT                                 │
│ Edit   Label   Comment                                                 │
├──────────────────────────────────────────────────────────────────────┤
│ Message:                                                               │
│ ┌──────────────────────────────────────────────────────────────────┐ │
│ │Enter any number to be raised to the 5th power...                ▲  │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ │ ◀ ▢                                                             ▶  │ │
│ └──────────────────────────────────────────────────────────────────┘ │
│ Variable:     ┌──────────────────────────────┐                        │
│               │mynumber$│                     │                        │
│               └──────────────────────────────┘                        │
│                    ┌────────────┐   ┌────────────┐                     │
│                    │     OK     │   │   Cancel   │                     │
│                    └────────────┘   └────────────┘                     │
└──────────────────────────────────────────────────────────────────────┘
```
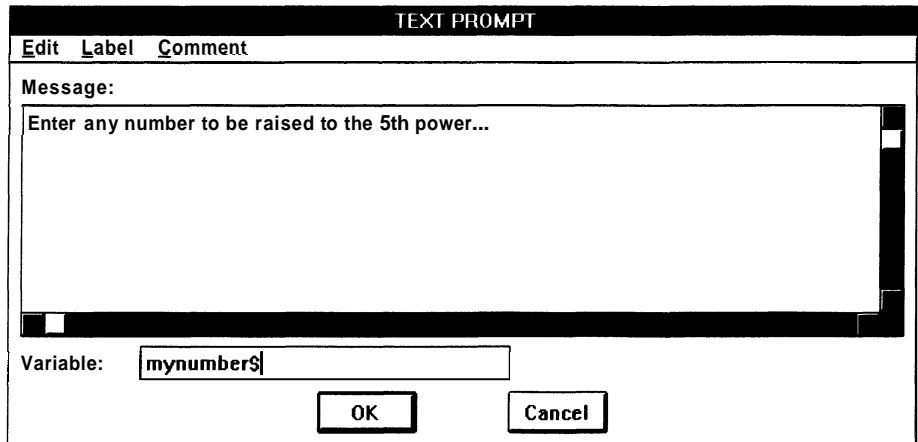
6. Use the keyboard keys to enter the following message in the **Message:** edit control box: Enter any number to be raised to the 5th power. Click the mouse on the **Variable:** edit control box and enter: *mynumber$.* The results should match the above illustration. This will assign the string variable named *mynumber* to whatever number you enter when you run the procedure.

7. Select the **OK** pushbutton. This will return you to the Main Menu. Verify that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ─                      TekTMS/IPG - (untitled)                  ┌──┐   │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                        F1=Help │
├──────────────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) ( )                                               │
│   PROMPT Enter any number to be raised to the 5th power...             │
│ END_PROCEDURE                                                          │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```
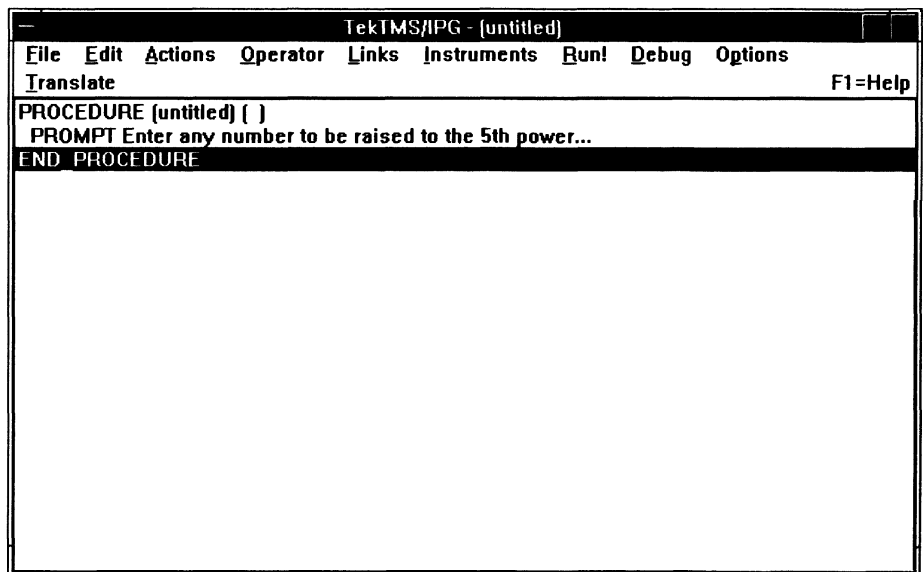
8. Select **Actions,** causing the Actions Menu (shown in the following illustration) to appear.
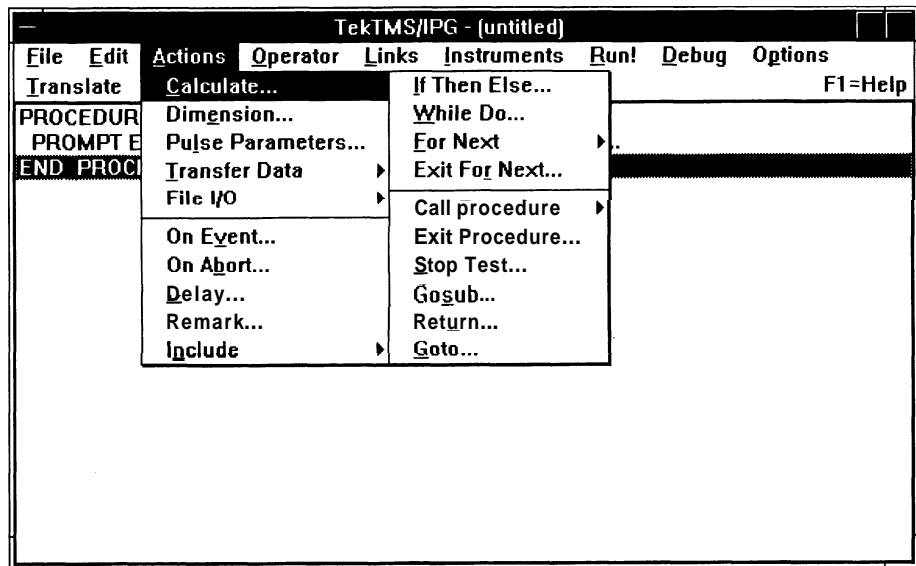
```
─                         TekTMS/IPG - (untitled)                    ▢▢
 File   Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options
 Translate   Calculate...           If Then Else...                 F1=Help
 PROCEDUR    Dimension...           While Do...
  PROMPT E   Pulse Parameters...    For Next            ▶ .
 END  PROC   Transfer Data       ▶  Exit For Next...
             File I/O            ▶
                                    Call procedure     ▶
             On Event...            Exit Procedure...
             On Abort...            Stop Test...
             Delay...               Gosub...
             Remark...              Return...
             Include             ▶  Goto...
```

9. Select **Calculate...**, causing the Calculate dialog box (shown in the following illustration) to appear.

```
                              CALCULATE
 Edit   Label   Comment

 Variable:                   Expression:

  mynumber              =    [VAL(mynumber$)]^5

                    | OK |              | Cancel |
```
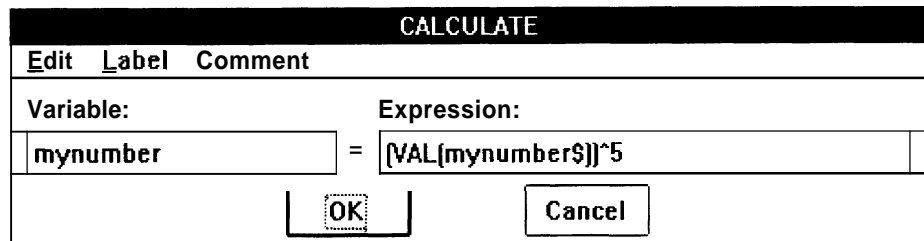
10. Enter the following in the **Variable:** edit box: mynumber. Click the mouse on the **Expression:** edit control box and enter: (VAL(mynumber$)) ^ 5. The results should match the above illustration. This will cause IPG to raise whatever number is in the variable *mynumber* to the fifth power.

11. Select the **OK** pushbutton to return to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ─                        TekTMS/IPG - (untitled)              ┌─┐ ┌─┐     │
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate                                                        F1=Help │
│ ┌─────────────────────────────────────────────────────────────────────┐ │
│ │PROCEDURE [untitled] ( )                                               │ │
│ │ PROMPT Enter any number to be raised to the 5th power...              │ │
│ │ CALCULATE mynumber = (val(mynumber$))^5                               │ │
│ │█END  PROCEDURE█████████████████████████████████████████████████       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ └─────────────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────────────┘
```
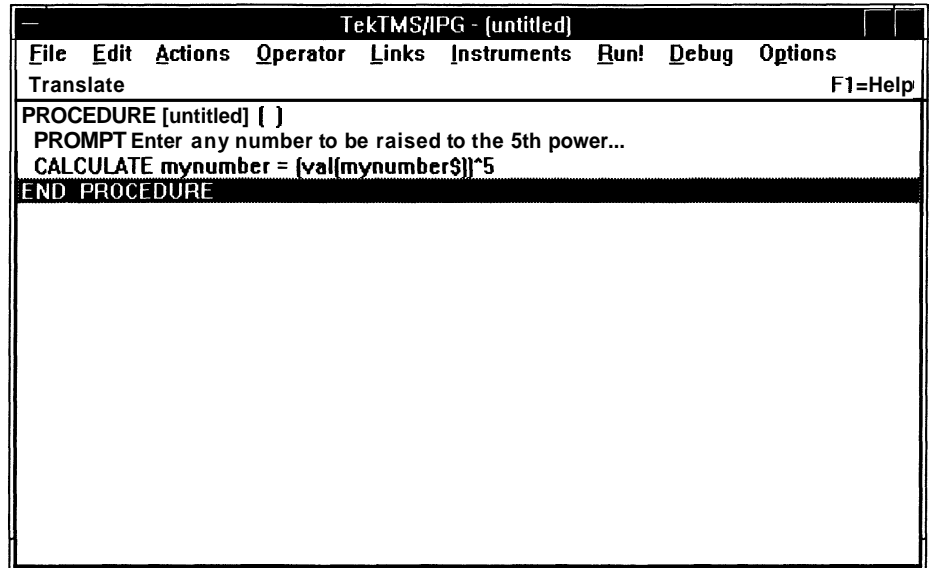
12. Select **Qperator,** causing the Operator Menu to appear (as in Step 3). Select **Display Data,** causing the Display Data Menu (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ─                        TekTMS/IPG - (untitled)              ┌─┐ ┌─┐     │
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate          ┌──────────────────────┐                     F1=Help │
│ ┌───────────────────│ Adjustment...        │───────────────────────────┐ │
│ │PROCEDURE (untitled │ Display XYPlot...    │                           │ │
│ │ PROMPT Enter any r │ Display Waveforms... │ 5th power...              │ │
│ │ CALCULATE mynumt   │█Display Data█████████│█Wait...████               │ │
│ │█END  PROCEDURE     │ Prompt               │ Continue...               │ │
│ │                    └──────────────────────│ Remove                    │ │
│ │                                           └────────────               │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ └─────────────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────────────┘
```
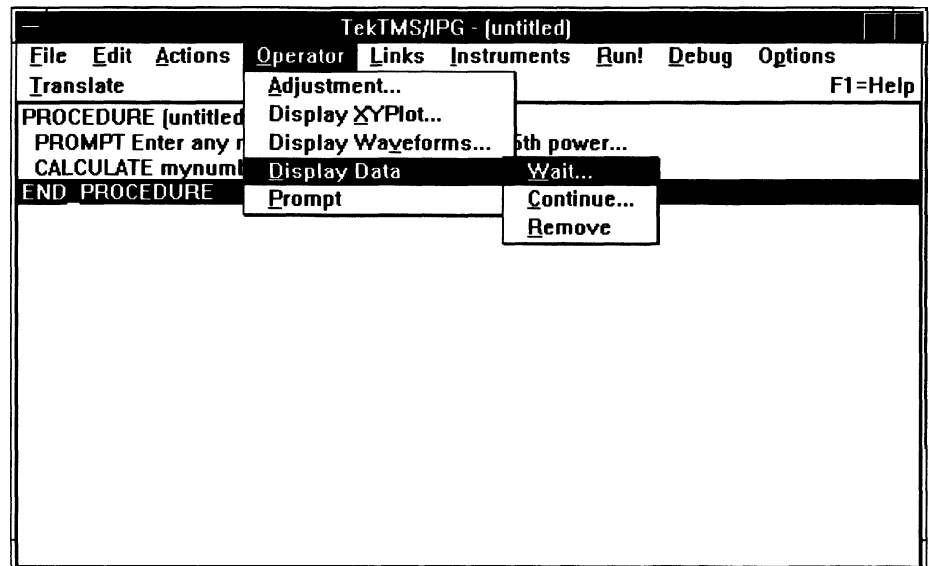
13. Select **Wait...**, causing the Display Data Wait dialog box (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                        TekTMS/IPG - (untitled)               ■ │■│ │
├─────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                      F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) ( )                                              │
│ PROM┌──────────────────── DISPLAY DATA WAIT ──────────────────────┐  │
│ CALCU│ Edit  Label  Comment                                        │  │
│ END  P│                                                            │  │
│       │ Caption:                                                   │  │
│       │ ┌────────────────────────────────────────────────────┬─┐  │  │
│       │ │                                                    │█│  │  │
│       │ │                                                    │ │  │  │
│       │ │                                                    │ │  │  │
│       │ │                                                    │ │  │  │
│       │ │                                                    ├─┤  │  │
│       │ └────────────────────────────────────────────────────┴─┘  │  │
│       │ Expression:                                                │  │
│       │ ┌────────────────────────────────────────────────────┐    │  │
│       │ │ mynumber                                            │    │  │
│       │ └────────────────────────────────────────────────────┘    │  │
│       │        ┌────────┐          ┌──────────┐                    │  │
│       │        │  OK    │          │  Cancel  │                    │  │
│       │        └────────┘          └──────────┘                    │  │
│       └────────────────────────────────────────────────────────────┘  │
└─────────────────────────────────────────────────────────────────────┘
```

14. Ignore the **Caption:** edit box, but enter the following in the **Expression:** edit box: *mynumber.* The results should match the above illustration. Select the **OK** pushbutton to return to the Main Menu. Verify that your display matches the following illustration. This step tells IPG to display the results of raising the number you entered to the fifth power.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                        TekTMS/IPG - (untitled)               ┌─┐┌─┐ │
├─────────────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Bun!   Debug   Options │
│ Translate                                                      F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) [ ]                                             │
│  PROMPT Enter any number to be raised to the 5th power...            │
│  CALCULATE mynumber = (val(mynumber$))^5                             │
│  DISPLAY mynumber                                                    │
│ END  PROCEDURE                                                       │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
└─────────────────────────────────────────────────────────────────────┘
```
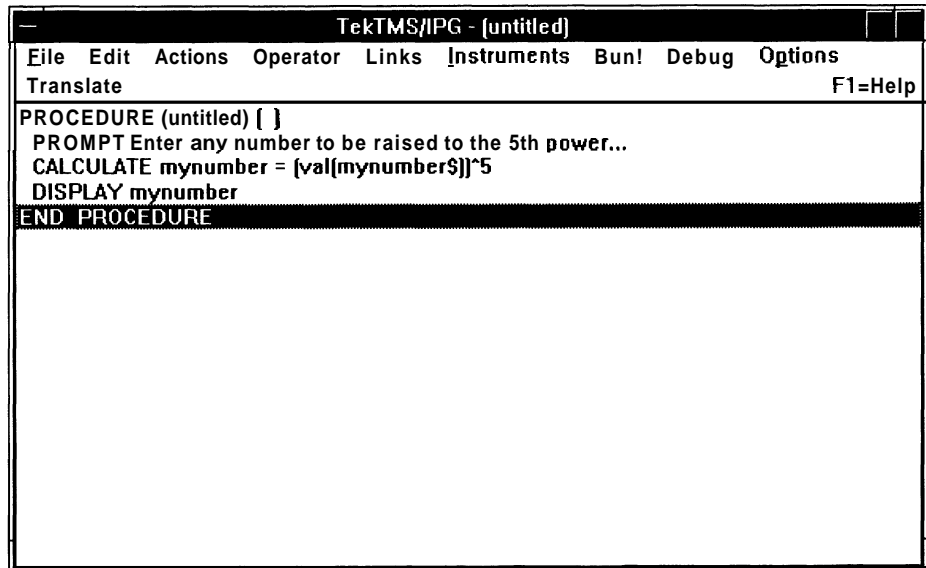
15. We are now ready to name the test procedure. Select **File**, causing the File Menu to appear (as in Step 1). Select **Save as...**, causing the Save File As dialog box (shown in the following illustration) to appear.
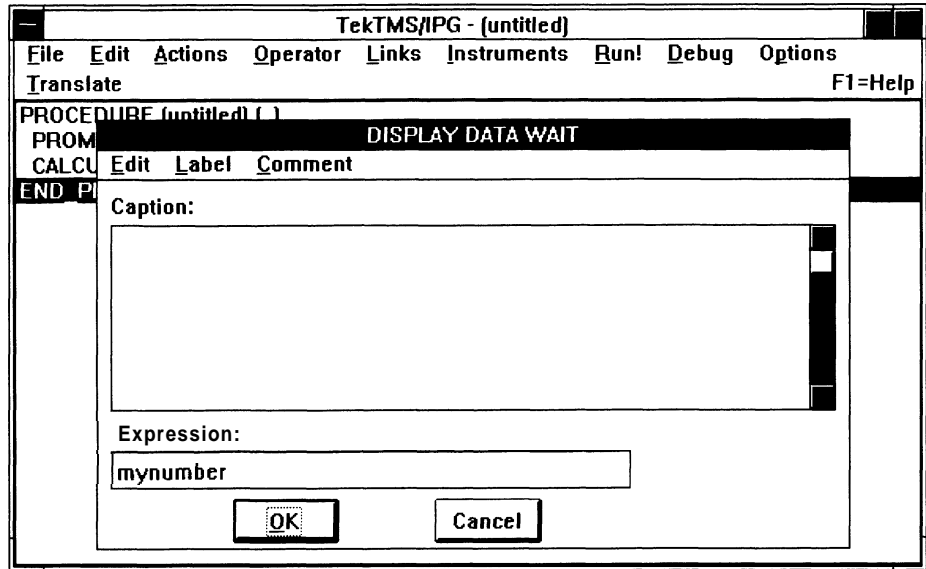
```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                    TekTMS/IPG - [untitled]                    ▓▓    │
│ File  Edit  Actions  Operator  Links  Instruments  Bun!  Debug  Options│
│ Translate                                                    F1=Help  │
│ PROCEDURE [untitled] [ ]                                              │
│  PROMPT Enter any number to be raised to the 5th power...            │
│  CALCUL┌──────────────────────────────────────────────┐             │
│  DISPLA│ Save file as:       c:\...\docs\manchang      │             │
│ END PR │                                               │             │
│        │  ┌──────────────────────────────────────┐    │             │
│        │  │test1                                  │    │             │
│        │  └──────────────────────────────────────┘    │             │
│        │  Edit Password:                               │             │
│        │  ┌──────────────────────┐   ┌──────────┐     │             │
│        │  │                      │   │  Save:   │     │             │
│        │  └──────────────────────┘   └──────────┘     │             │
│        │  Run Password:                                │             │
│        │  ┌──────────────────────┐   ┌──────────┐     │             │
│        │  │                      │   │  Cancel  │     │             │
│        │  └──────────────────────┘   └──────────┘     │             │
│        └──────────────────────────────────────────────┘             │
└─────────────────────────────────────────────────────────────────────┘
```
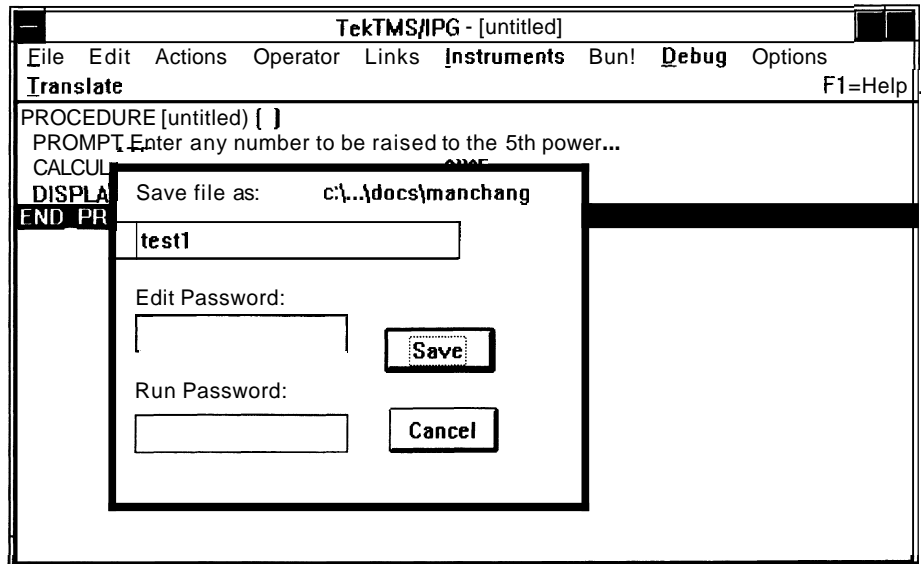
16. Enter the following in the **Save** File **as:** edit control box: testl. Ignore the **Edit Password:** and **Run Password:** edit control boxes. The results should match the above illustration. (Notice the disk drive and pathname in the upper right corner of the dialog box. This is the location that IPG will save your procedure.) Select **Save** to name the file and return to the Main Menu. Verify that your display matches the following illustration. Notice that the Title Bar of the window, which had previously been labeled TekTMS (untitled), now is labelled *TekTMS-TEST1*.PRG.
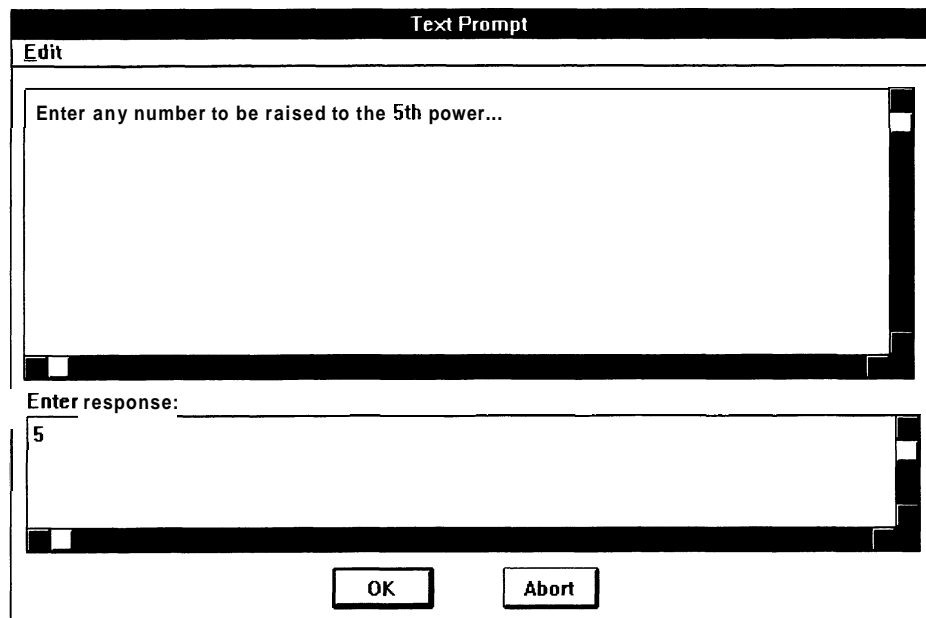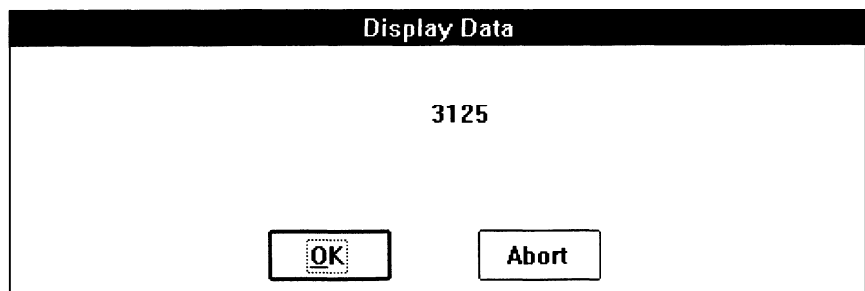
```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                    TekTMS/IPG - IPG.PRG                       ▓▓    │
│ File  Edit  Actions  Operator  Links  Instruments  Bun!  Debug  Options│
│ Translate                                                    F1=Help  │
│ PROCEDURE IPG [ ]                                                     │
│  PROMPT Enter any number to be raised to the 5th power...            │
│  CALCULATE mynumber = [val(mynumber$)]^5                             │
│   DISPLAY mynumber                                                   │
│ END_PROCEDURE                                                         │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
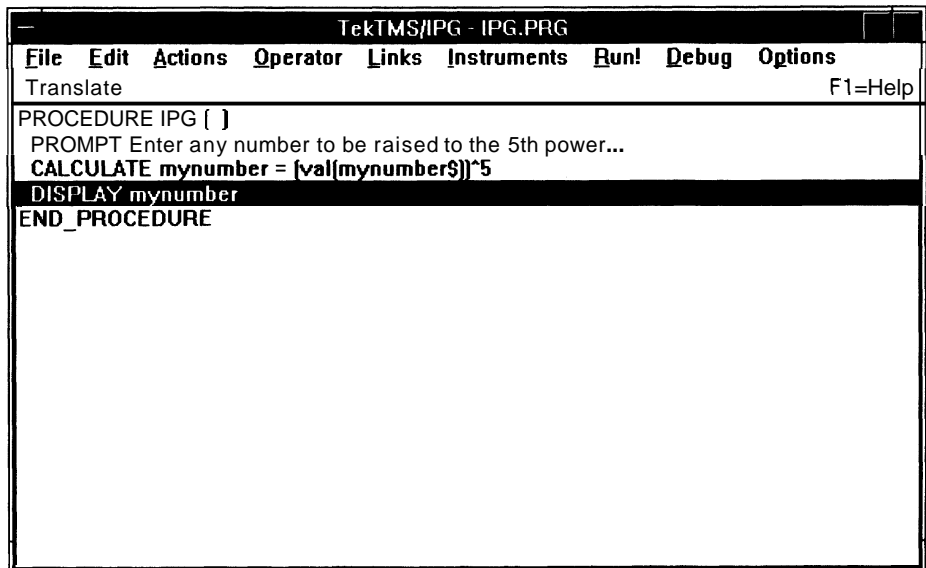
17. We can now run the procedure. Select **Bun!.** The Text Prompt window shown in the following illustration will appear.

```
┌──────────────────────────────────────────────────────────────────┐
│                            Text Prompt                             │
│ Edit                                                               │
│ ┌────────────────────────────────────────────────────────────┐    │
│ │ Enter any number to be raised to the 5th power...          │    │
│ │                                                            │    │
│ │                                                            │    │
│ │                                                            │    │
│ └────────────────────────────────────────────────────────────┘    │
│ Enter response:                                                    │
│ ┌────────────────────────────────────────────────────────────┐    │
│ │ 5                                                          │    │
│ │                                                            │    │
│ └────────────────────────────────────────────────────────────┘    │
│              ┌──────────┐        ┌──────────┐                      │
│              │    OK    │        │  Abort   │                      │
│              └──────────┘        └──────────┘                      │
└──────────────────────────────────────────────────────────────────┘
```

18. Enter a number in the **Enter Response:** edit box. (In the above illustration, the number entered was 5.) Select **OK.** IPG will respond with the Display Data message box shown in the following illustration. The number you entered (raised to the fifth power) will be shown. Select **OK** to end the procedure and return to the Main Menu.

```
┌──────────────────────────────────────────────────┐
│                   Display Data                     │
│                                                    │
│                      3125                          │
│                                                    │
│        ┌──────────┐        ┌──────────┐            │
│        │   OK     │        │  Abort   │            │
│        └──────────┘        └──────────┘            │
└──────────────────────────────────────────────────┘
```

Test Procedure Number 2

In this procedure we will show how IPG transparently handles waveforms and displays them in an interactive graphic window.
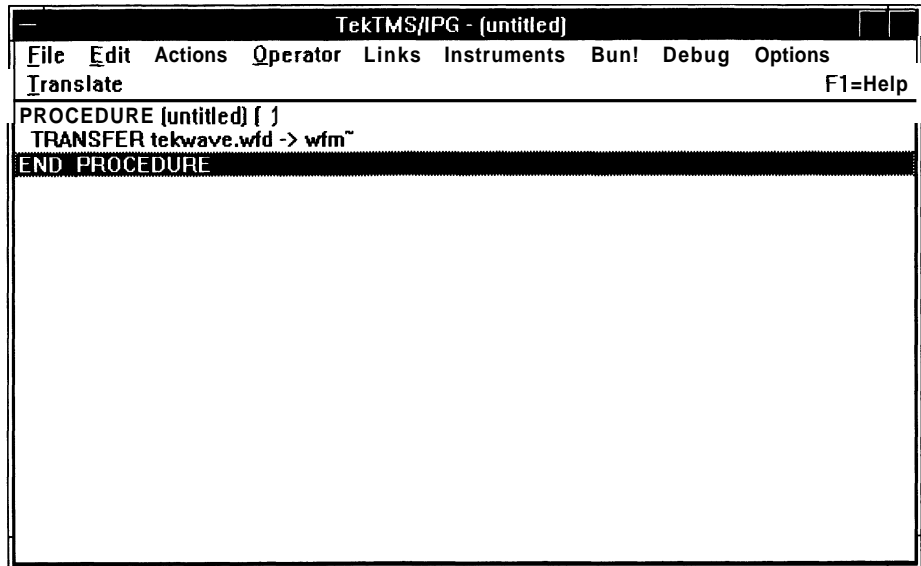
1. Select **File** from the Main Menu bar. Select **New** from the File Menu. Select **Actions** from the Main Menu, then select **Transfer Data** from the Actions Menu. The Transfer Data menu (shown in the following illustration) will appear.
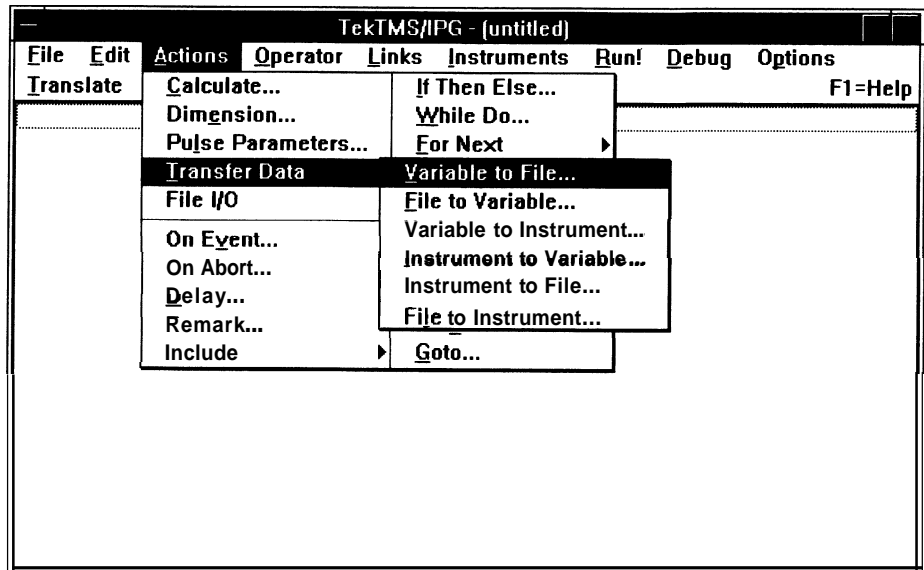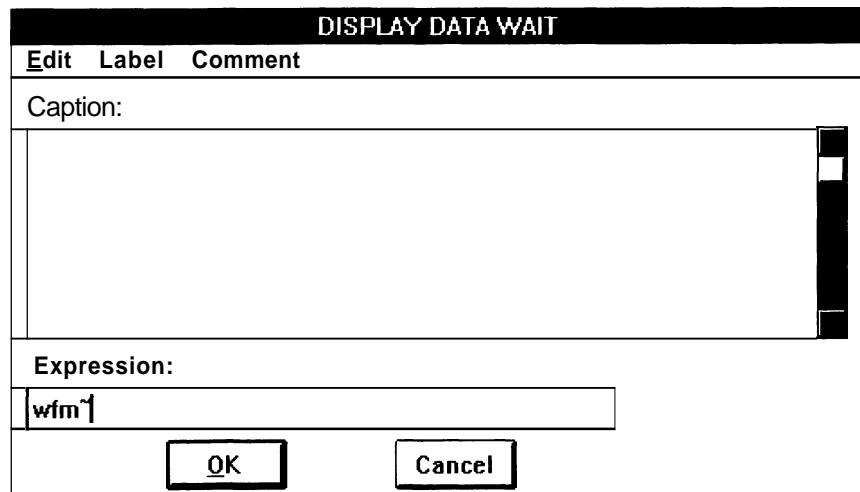

2. Select **File to Variable...**, causing the File to Variable dialog box (shown in the following illustration) to appear.
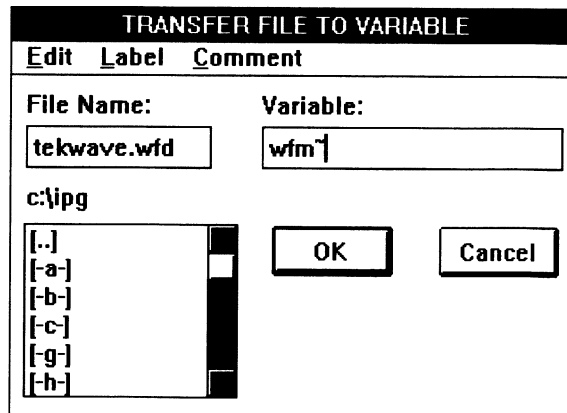
3. Enter *tekwave.wfd* (a waveform display file included on the IPG disk for tutorial purposes) in the File Name: edit box. Notice the disk drive and pathname directly under the File Name: edit control box. This pathnarne must be the correct location for the *tekwave.wfd* file. If it is not, select the correct disk drive, then the pathname, from the list box under the disk drive and pathnarne currently given. Enter *wfm* ~ in the Variable: edit box. This assigns the waveform display in *tekwave.wfd* to the variable name *wfm* ~ . The results should match the above illustration. Select OK to return to the Main Menu, and verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                    TekTMS/IPG - (untitled)                    ▢▢    │
│ File  Edit  Actions  Operator  Links  Instruments  Bun!  Debug  Options │
│ Translate                                                      F1=Help │
│ PROCEDURE (untitled) [ ]                                               │
│  TRANSFER tekwave.wfd -> wfm~                                          │
│ END  PROCEDURE                                                         │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
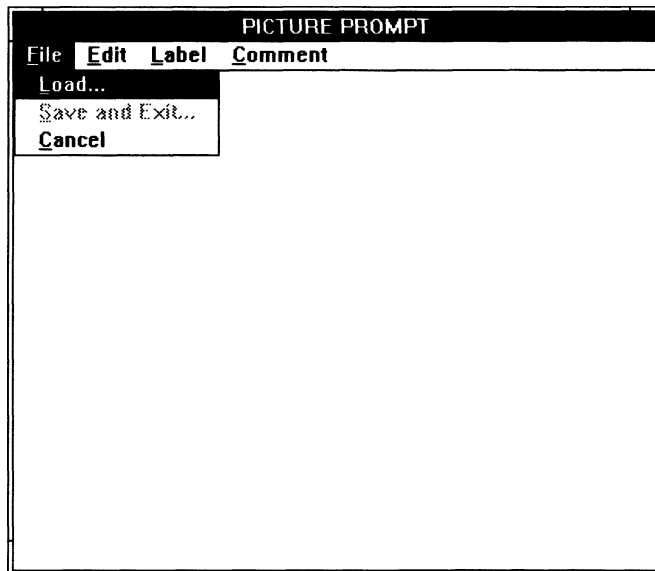
4. Select Operator, then select Display Data from the Operator Menu. Select Wait**...** from the Display Data Menu. The Display Data Wait dialog box (shown in the following illustration) will appear.

```
┌─────────────────────────────────────────────────────────┐
│                    DISPLAY DATA WAIT                      │
│ Edit   Label   Comment                                   │
│ Caption:                                                 │
│ ┌───────────────────────────────────────────────────┐ ▮ │
│ │                                                   │   │
│ │                                                   │   │
│ │                                                   │   │
│ │                                                   │   │
│ │                                                   │   │
│ └───────────────────────────────────────────────────┘ ▮ │
│ Expression:                                              │
│ ┌───────────────────────────────────────────────────┐   │
│ │wfm~│                                               │   │
│ └───────────────────────────────────────────────────┘   │
│         ┌─────────┐        ┌─────────┐                   │
│         │   OK    │        │ Cancel  │                   │
│         └─────────┘        └─────────┘                   │
└─────────────────────────────────────────────────────────┘
```

Creating and Editing Test Procedures

5. Enter *wfm* ~ in the **Expression:** edit box. This tells IPG to display the waveform. Your display should now match the preceding illustration. Select **OK** to return to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                    TekTMS/IPG - (untitled)                    ┌ ┐  │
│ File   Edit   Actions   Operator   Links   instruments   Run!   Debug   Options │
│ Translate                                                      F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE [untitled] ( )                                              │
│   TRANSFER tekwave.wfd -> wfm~                                        │
│   DISPLAY wfm~                                                        │
│ END  PROCEDURE                                                        │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
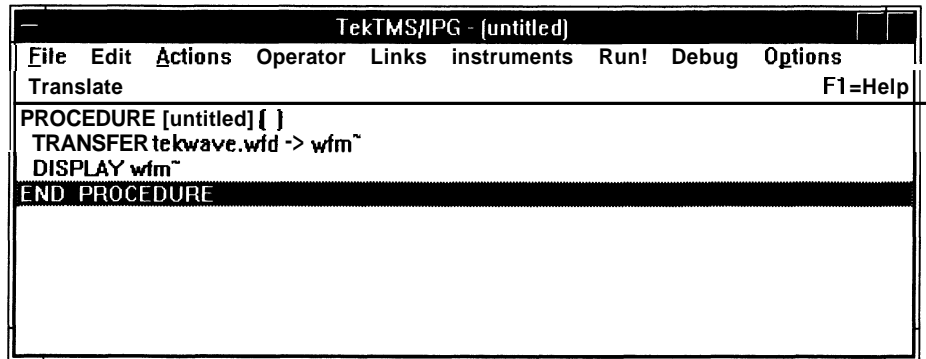
6. Select **File,** then **Save as....** Enter test2 in the **Save File as:** edit box, then select **Save** to save the file and return to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ─                    TekTMS/IPG - TEST2.PRG                     ┌ ┐  │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                      F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE TEST2 ( )                                                   │
│   TRANSFER tekwave.wfd -> wfm~                                        │
│   DISPLAY wfm~                                                        │
│ END_PROCEDURE                                                         │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
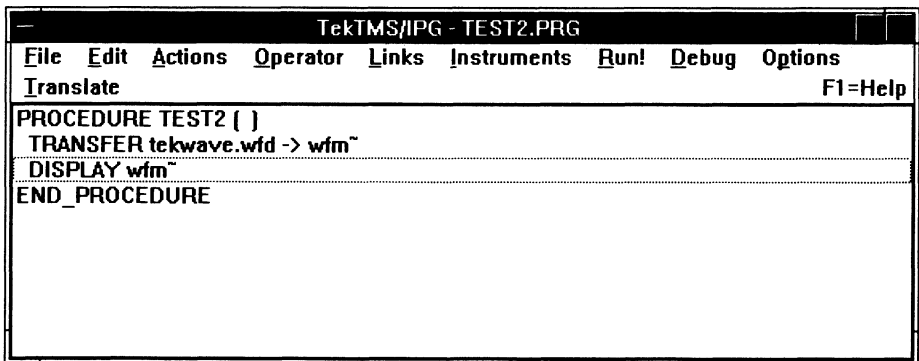
7. Select **Run!.** The following waveform display will appear.
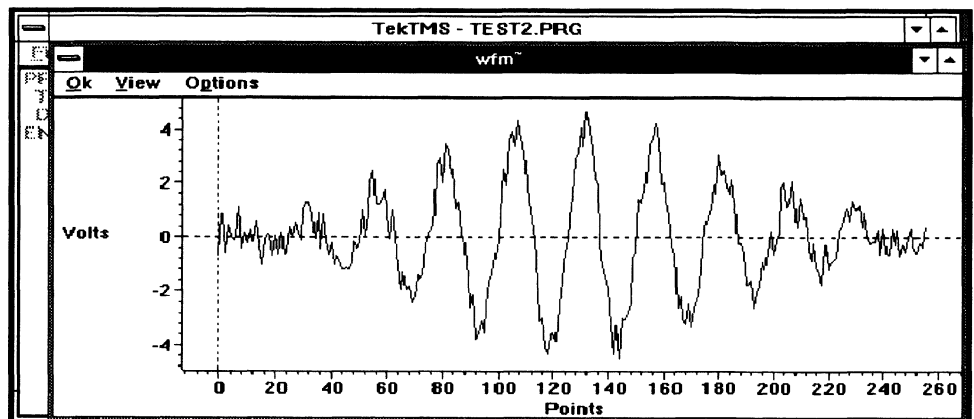
Select **OK** to exit the waveform display and return to the Main Menu. We will use this test procedure again in Section 5, Advanced Applications, to demonstrate the interaction you can perform with a waveform display.

Test Procedure Number 3

In this procedure, you will learn how to display a picture of a circuit board layout to assist the operator in locating and adjusting a control.

1. Select **File** from the Main Menu, then select **New** from the File Menu. Select **Operator** from the main Menu, then select **Prompt** from the Operator Menu. This will cause the Prompt Menu (shown in the following illustration) to appear.
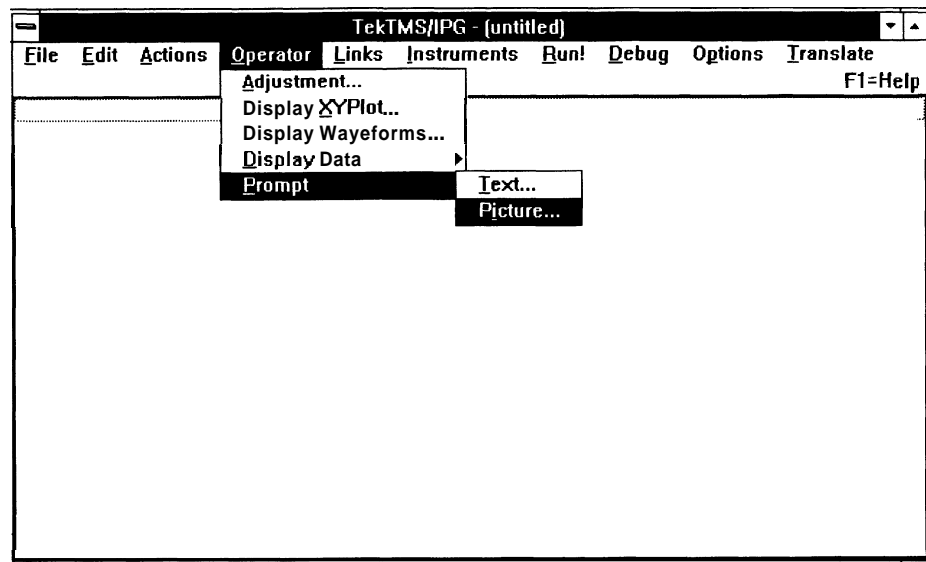
2. Select **Picture...**, causing the Picture Prompt dialog box (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────┐
│              PICTURE PROMPT                   │
├─────────────────────────────────────────────┤
│  File   Edit   Label   Comment                │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
└─────────────────────────────────────────────┘
```
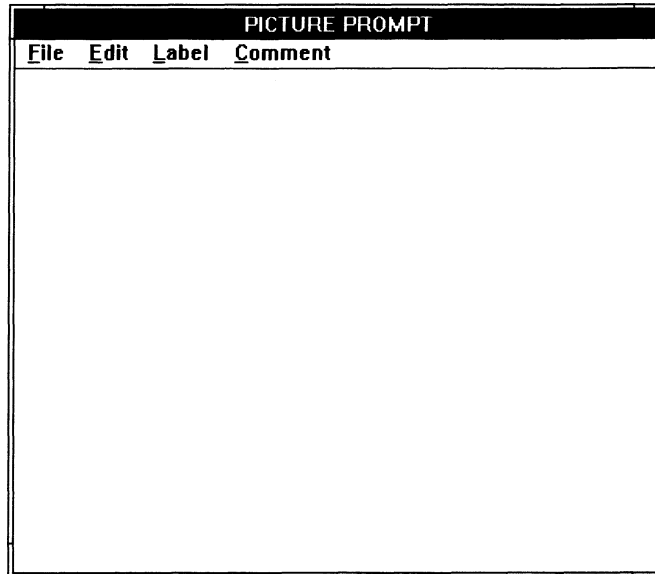
3. Select **File**, causing the Picture Prompt File Menu (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────┐
│              PICTURE PROMPT                   │
├─────────────────────────────────────────────┤
│  File   Edit   Label   Comment                │
│ ┌──────────────────┐                          │
│ │ Load...          │                          │
│ │ Save and Exit... │                          │
│ │ Cancel           │                          │
│ └──────────────────┘                          │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
└─────────────────────────────────────────────┘
```

4. Select **Load...**, causing the Load File dialog box (shown in the following illustration) to appear.
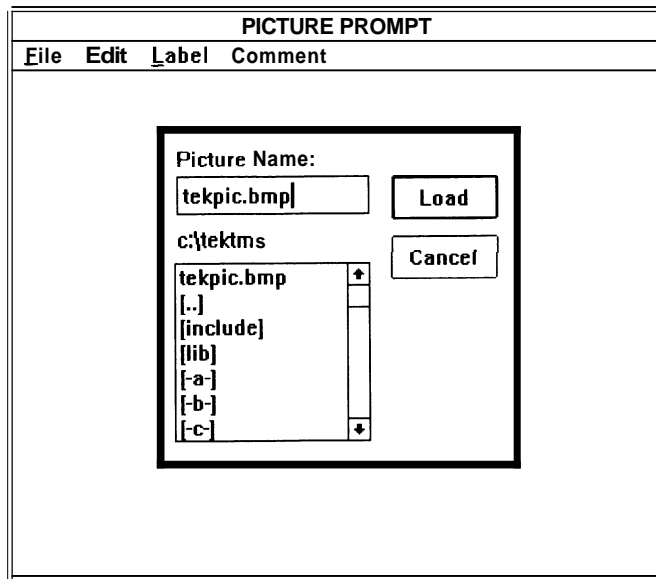
5. Enter *tekpic.bmp* in the **Picture Name:** edit box. (Notice the disk drive and pathname below the **Picture Name:** edit box. The disk drive and path should match the location of the TEKPIC.BMP file. If they do not, point and click the mouse to select the correct disk drive and path from the list box below the existing disk drive and path.) The results should match the above illustration. Select **Load** to load the file and return to the Picture Prompt dialog box. The circuit board picture in the TEKPIC.BMP file will appear as shown in the following illustration. This picture will be shown to the operator when the file is run to help in locating the control to be adjusted on the circuit under test.
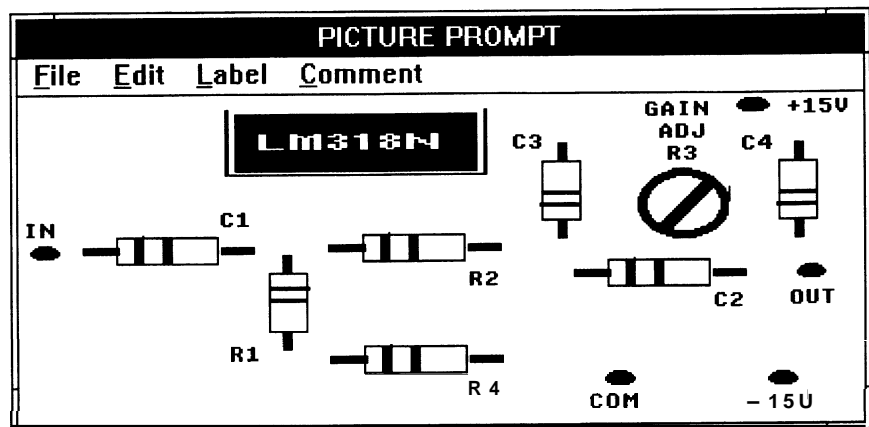
6. Select **File**, causing the Picture Prompt File Menu to appear. Select **Save and Exit...**, saving the picture file to your procedure and returning you to the Main Menu. Verify that your display matches the following illustration.
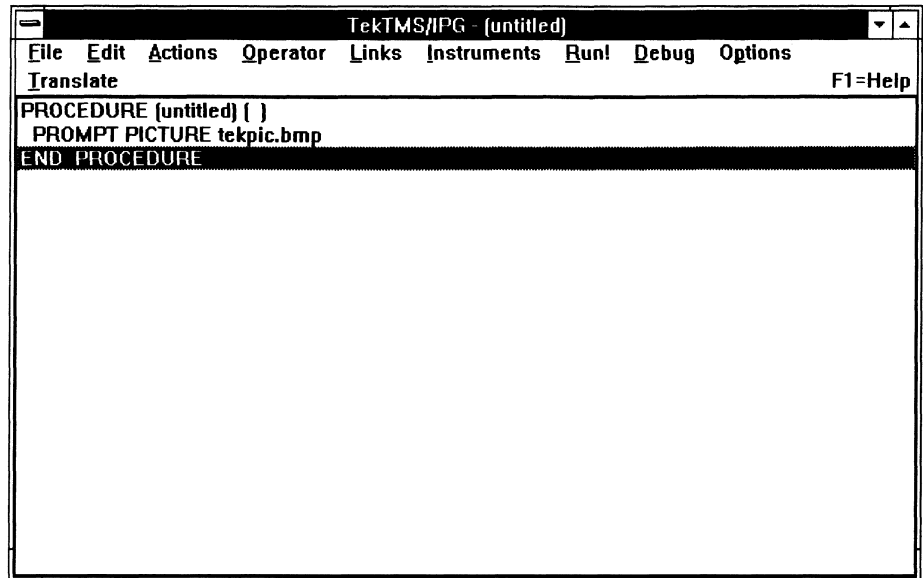
7. Select **Operator,** causing the Operator Menu to appear. Select **Adjustment...,** causing the Adjustment dialog box (shown in the following illustration) to appear.
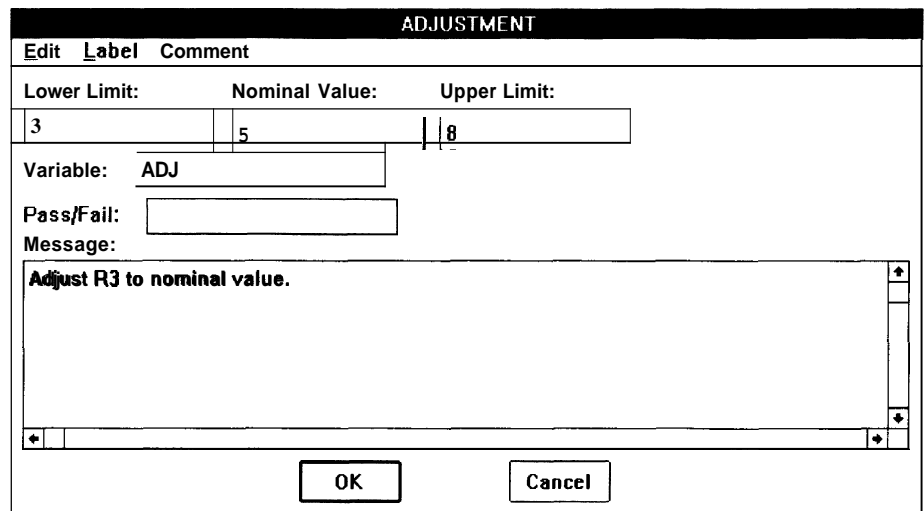
8. Enter 3 in the **Lower Limit:** edit box, *5* in the **>Nominal Value:** edit box, **8** in the **Upper Limit:** edit control box, ADJ in the **Variable:** edit box, and the following in the **Message:** edit box: Adjust R3 to nominal value. The results should match the above illustration. These entries set the limits that you want on the adjustment of R3 (in this case, the output of an amplifier), and display a message to the operator to tell him what operation to perform. Select **OK** to return to the Main Menu. Verify that your display matches the following illustration.

```
┌────────────────────────────────────────────────────────────────┐
│ ⊖              TekTMS/IPG - (untitled)                     ▼ ▲ │
├────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                    F1=Help│
├────────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) ( )                                         │
│  PROMPT PICTURE tekpic.bmp                                       │
│  ADJUSTMENT ADJ LOW 3 NOMINAL 5 HIGH 8                           │
│  END_ADJUSTMENT                                                  │
│ END_PROCEDURE                                                    │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
│                                                                  │
└────────────────────────────────────────────────────────────────┘
```
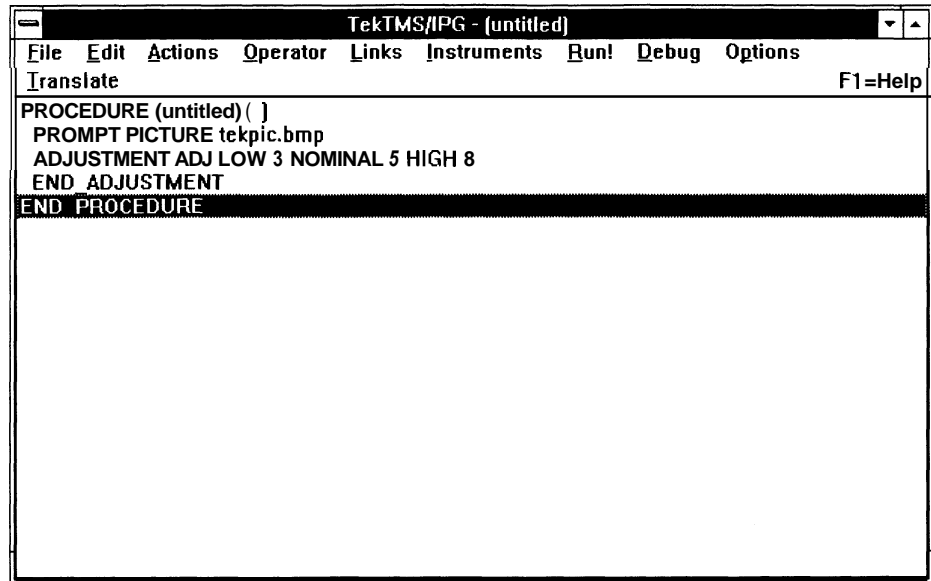
NOTE

Since we do not have an instrument or test circuit connected, we will insert steps, using the IPG random number generator to create simulated output readings from the amplifier under test, and to add a delay so that we can more easily observe the results. We will place these steps inside the ADJUSTMENT loop. In an actual test procedure, these steps would not be *necessary.*

9. Point and click the mouse on the END–ADJUSTMENT step in your procedure to highlight it (This will allow us to enter the next two steps before the END–ADJUSTMENT). Select **Actions,** causing the Actions Menu to appear. Select **Calculate...,** causing the Calculate dialog box (shown in the following illustration) to appear.

```
                         CALCULATE
 Edit   Label   Comment

 Variable:                      Expression:

 ADJ                       =   RND(0)*10

                    OK              Cancel
```

10. Enter *ADJ* in the **Variable:** edit box and *RND(0)*10* in the **Expression:** edit box. The results should match the above illustration. Select **OK** to return to the Main Menu. Verify that your display matches the following illustration.

```
 ═                        TekTMS/IPG - (untitled)                    ▼ ▲
 File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options
 Translate                                                      F1=Help
 PROCEDURE [untitled] ( )
  PROMPT PICTURE tekpic.bmp
  ADJUSTMENT ADJ LOW 3 NOMINAL 5 HIGH 8
    CALCULATE ADJ = RND(0)*10
    END  ADJUSTMENT
 END_PROCEDURE
```

11. Select **Actions,** then select **Delay...**, causing the Delay dialog box (shown in the following illustration) to appear.

```
                DELAY
 Edit    Label    Comment

  1000                  Milliseconds

        OK            Cancel
```

12. Enter *1000* in the edit box. The results should match the above illustration. This will insert a one second delay in the random number generation sequence to provide a more realistic simulation of test measurements. Select **OK** to return to the main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬                    TekTMS/IPG - (untitled)                    ▼ ▲   │
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate                                                    F1=Help │
│ ┌───────────────────────────────────────────────────────────────────┐ │
│ │PROCEDURE [untitled] [ }                                            │ │
│ │  PROMPT PICTURE tekpic.bmp                                         │ │
│ │  ADJUSTMENT ADJ LOW 3 NOMINAL 5 HIGH 8                             │ │
│ │    CALCULATE ADJ = RND(0)*10                                       │ │
│ │    DELAY 1000 MILLISECONDS                                         │ │
│ │    END  ADJUSTMENT                                                 │ │
│ │END_PROCEDURE                                                       │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ └───────────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────────┘
```

13. Select **File**, then select **Save as....** Enter *test3* in the **Save File as:** edit box. Select **OK** to return to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬                    TekTMS/IPG - TEST3.PRG                     ▼ ▲   │
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate                                                    F1=Help │
│ ┌───────────────────────────────────────────────────────────────────┐ │
│ │PROCEDURE TEST3 [ }                                                 │ │
│ │  PROMPT PICTURE tekpic.bmp                                         │ │
│ │  ADJUSTMENT ADJ LOW 3 NOMINAL 5 HIGH 8                             │ │
│ │    CALCULATE ADJ = RND(0)*10                                       │ │
│ │    DELAY 1000 MILLISECONDS                                         │ │
│ │    END  ADJUSTMENT                                                 │ │
│ │END_PROCEDURE                                                       │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ │                                                                    │ │
│ └───────────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────────┘
```

14. Select **Run!.** As in the following illustration, IPG will display the circuit board picture showing the adjustment location.
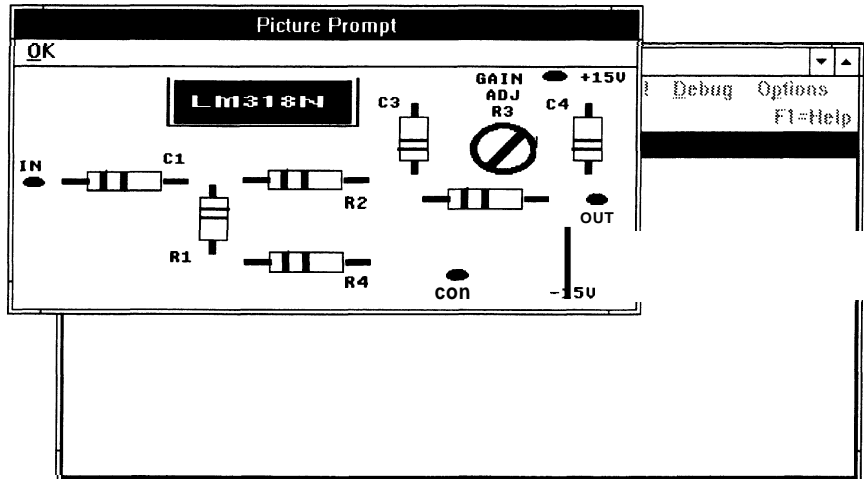
15. Select **QK.** As shown in the following illustration, IPG will now display a message box showing the limits set for the adjustment, the nominal value, and a message telling the operator what is expected. The point between the right and left arrows indicates the level to which the operator must adjust the output (shown by the moving diamond pointer) to achieve the specified nominal value. The random number generation step we included in the procedure will simulate output readings taken on the circuit under test while the operator adjusts R3.

Notice the words **In Range** in the lower right portion of the message box. This indicates that the current reading is in the range specified by the lower and upper limits. if the reading is not within the limits, the **In Range** message will disappear.

16. Select **OK** to end the procedure and return to the Main Menu.

Test Procedure Number 4

In this procedure, we will learn how to select, configure, and use an instrument front panel driver to develop a test procedure step in which we set up all controls for the specified instrument. If you do not have the oscilloscope specified in the Hardware description (earlier in this section) connected, you will still be able to complete this procedure and emulate the actual running.

1. Select **File**, then select **New.** Select **Instruments,** causing the Instruments Menu (shown in the following illustration) to appear.
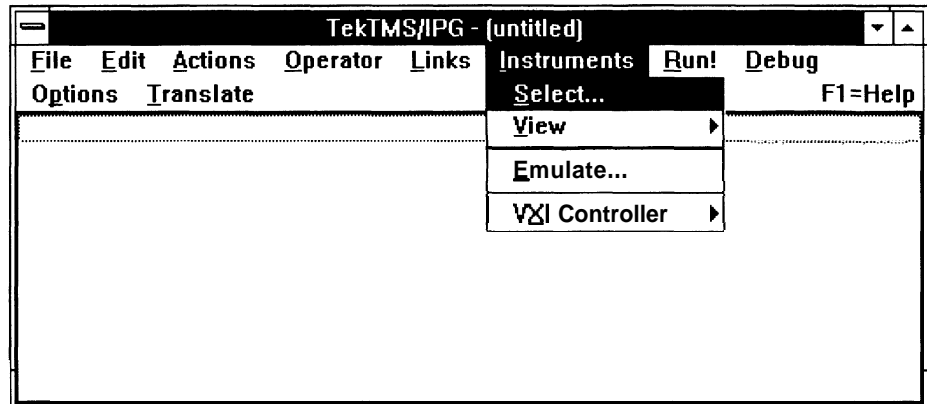
2. Select **Select...**, causing the Select dialog box (shown in the following illustration) to appear.
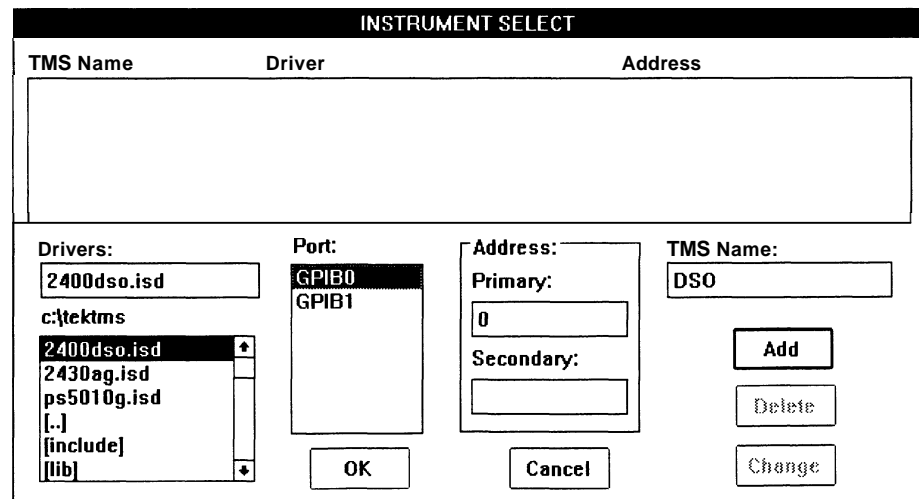
3. Point and double click the mouse on *2400dso.isd* in the list box in the lower left corner. This will select that instrument driver and cause entries to appear in the **Drivers:** and **Port:** edit boxes. Enter the primary GPIB address of the instrument in the **Address: Primary:** edit control box. (If you do not have an instrument connected, enter *0*.) Enter DSO in the TMS **Name:** edit box.

4. Select **Add.** This will cause the information in the edit boxes to appear in the large list box at the top of the dialog box, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│                          INSTRUMENT SELECT                                │
│  TMS Name            Driver              Port          Address            │
│  ▓DSO▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓2400dso.isd▓▓▓▓▓▓▓▓▓GPIB0▓▓▓▓▓▓▓▓▓PRI 00▓▓▓▓▓▓▓▓▓▓▓  │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│  Drivers:              Port:          ┌─Address:───┐   TMS Name:          │
│  ┌─────────────────┐   ┌─────────┐    │ Primary:   │   ┌─────────────────┐│
│  │ 2400dso.isd     │   │▓GPIB0▓▓▓│    │            │   │ DSO             ││
│  └─────────────────┘   │ GPIB1   │    │ ┌────────┐ │   └─────────────────┘│
│  c:\tektms             │         │    │ │ 00     │ │                      │
│  ┌───────────────┐─┐   │         │    │ └────────┘ │   ┌──────────────┐   │
│  │▓2400dso.isd▓▓▓│▲│   │         │    │ Secondary: │   │    Add       │   │
│  │ 2430ag.isd    │ │   │         │    │ ┌────────┐ │   └──────────────┘   │
│  │ ps5010g.isd   │ │   │         │    │ │        │ │   ┌──────────────┐   │
│  │ [..]          │ │   │         │    │ └────────┘ │   │   Delete     │   │
│  │ [include]     │ │   └─────────┘    └────────────┘   └──────────────┘   │
│  │ [lib]         │▼│   ┌─────────┐    ┌────────────┐   ┌──────────────┐   │
│  └───────────────┘─┘   │   OK    │    │  Cancel    │   │   Change     │   │
│                        └─────────┘    └────────────┘   └──────────────┘   │
└─────────────────────────────────────────────────────────────────────────┘
```
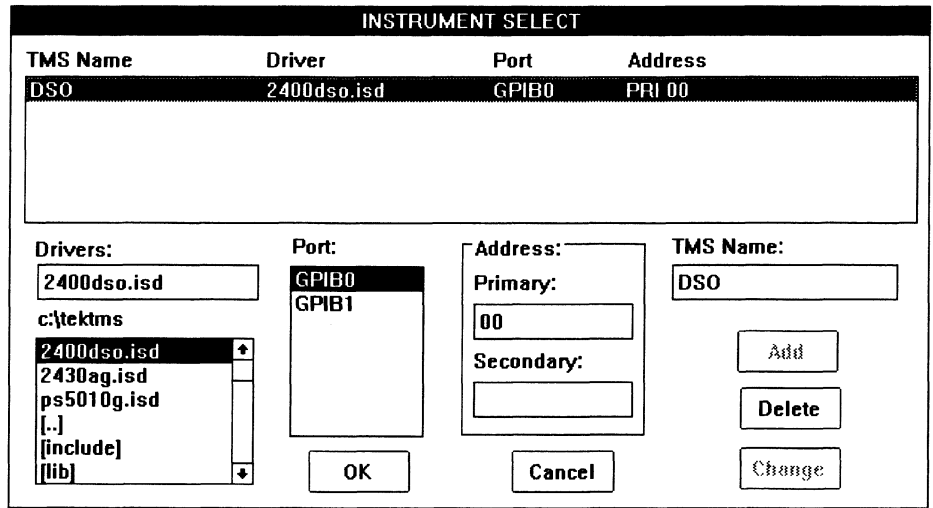
5. Select **OK** to return to the Main Menu (no change will be visible on the Main Menu display, since selecting an instrument does not create a procedure step). To display the instruments front panel, select **Instruments,** then **View,** and finally **DSO.** The following illustration shows this selection.

```
┌───────────────────────────────────────────────────────────────────────┐
│ ▬             TekTMS/IPG - (untitled)                            ▼│▲│  │
│ File   Edit   Actions   Operator   Links  Instruments  Run!  Debug      │
│ Options   Translate                       Select...              F1=Help│
│                                           View          ▓DSO▓           │
│                                           Emulate...                    │
│                                           VXI Controller  ▶             │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
└───────────────────────────────────────────────────────────────────────┘
```
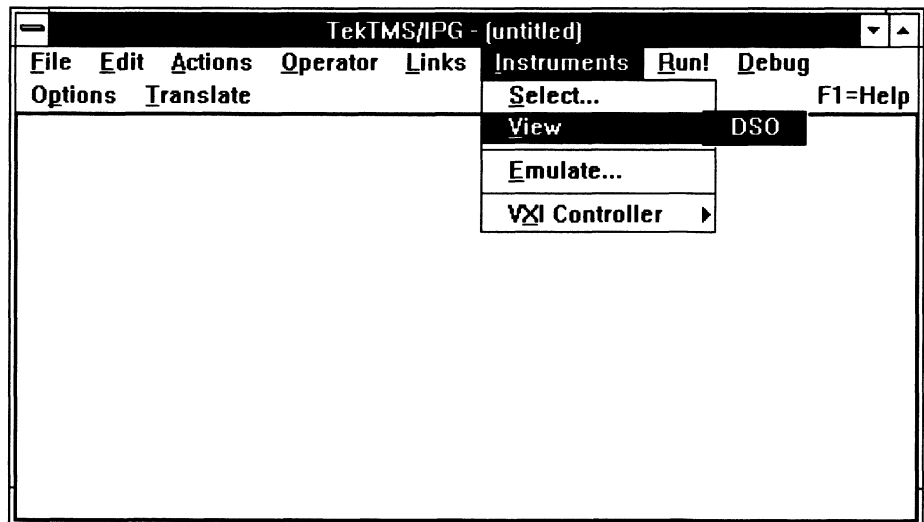
6. Click the mouse on the driver name (*2400dso.isd*) to highlight it, then select **OK.** The instrument panel view shown in the following illustration will appear.
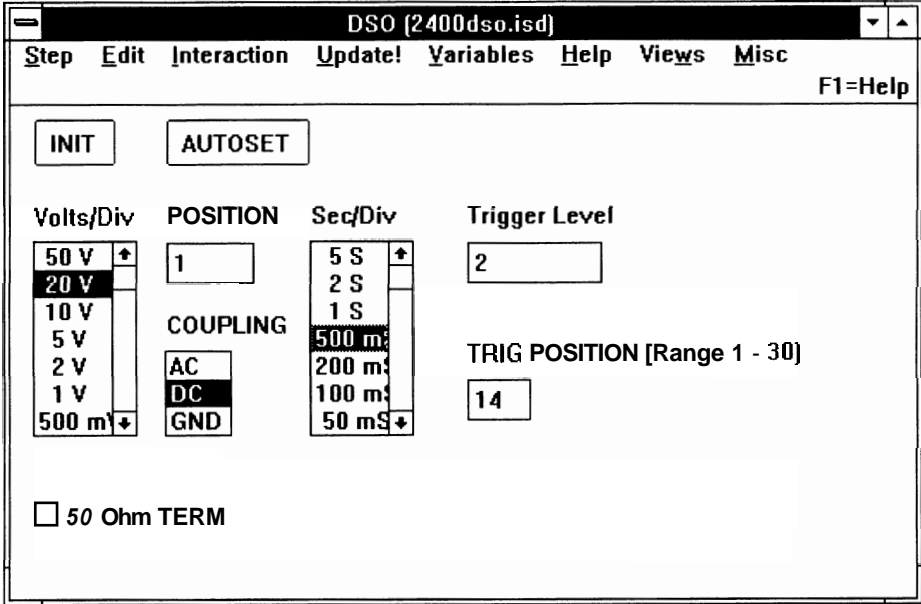
7. You can now set the controls to the desired settings by pointing and clicking the mouse on one of the multiple selections for a control (such as **Volts/div**), or by pointing and clicking the mouse on the entry box, then entering the desired setting, for controls that do not have all possible entries given (such as Trigger Level). After you have set the controls, select Step causing the Step Menu (shown in the following illustration) to appear.
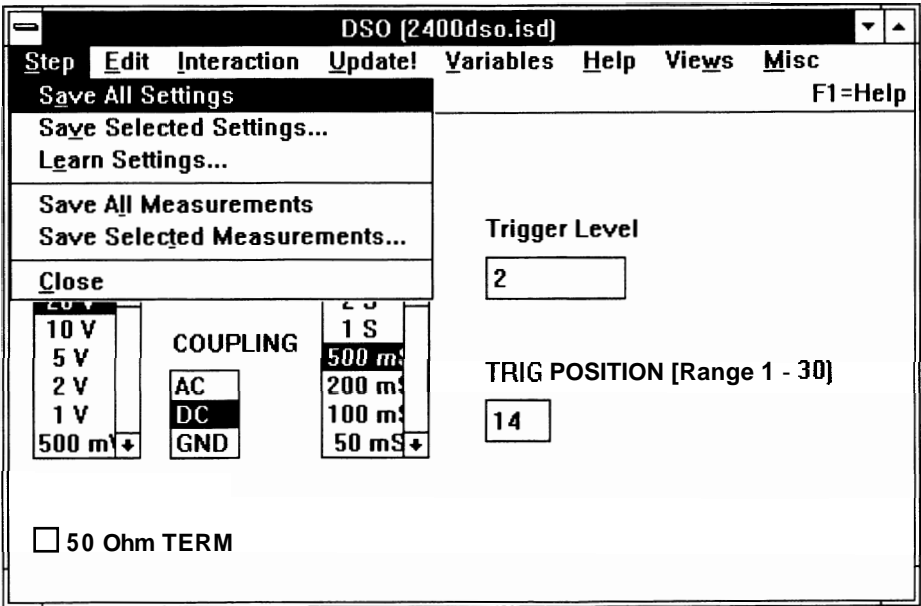
8. Select Save All Settings. This will save the control settings. Click on Step Close to exit the view. Select File, then select Save as.... When the Save As dialog box appears, enter *test4* in the Save File as: edit control box and select Save. Verify that your display matches the following illustration.

```
⊟                        TekTMS/IPG - (untitled)                    ▼ ▲
 File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options
 Translate                                                          F1=Help
 PROCEDURE [untitled] [ ]
  SETTING DSO INIT AUTOSET VOLTSDIV POSITION TERM COUPLING TIME_A ...
 END  PROCEDURE



```
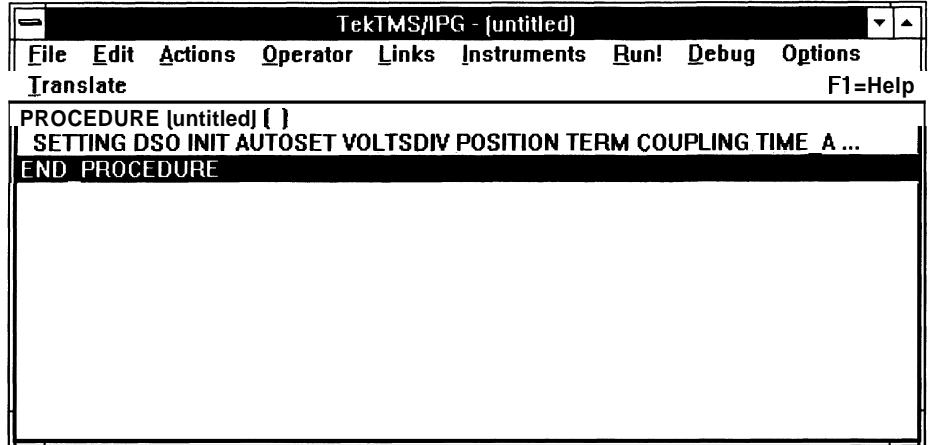
9. Resize the IPG Main Menu window to resemble the window shown in the following illustration.

```
⊟                        TekTMS/IPG - (untitled)                    ▼ ▲
 File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options
 Translate                                                          F1=Help
 PROCEDURE [untitled] [ ]                                             ▲
  SETTING DSO INIT AUTOSET VOLTSDIV POSITION TERM COUPLING TIME_A ...
 END  PROCEDURE                                                       ▼
```
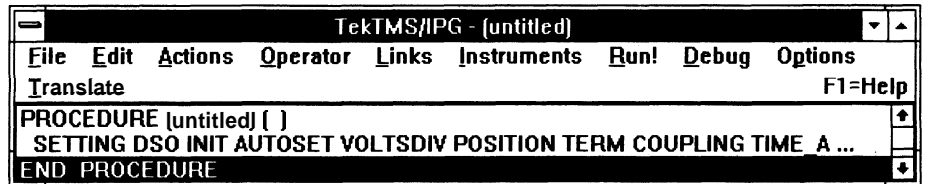
10. Select Debug, then select Trace Bus, causing the Trace Bus message box (shown in the following illustration) to appear.

```
⊟                        TekTMS/IPG - (untitled]                    ▼ ●
 File   Edit   Actions   Operator   links   Instruments   Bun!   Debug   Options
 Translate                                                          F1=Help
 PROCEDURE [untitled] [ ]                                             ▲
  SETTING DSO INIT AUTOSET VOLTSDIV POSITION TERM COUPLING TIME_A ...
 END  PROCEDURE                                                       ▼
                           TRACE BUS


```
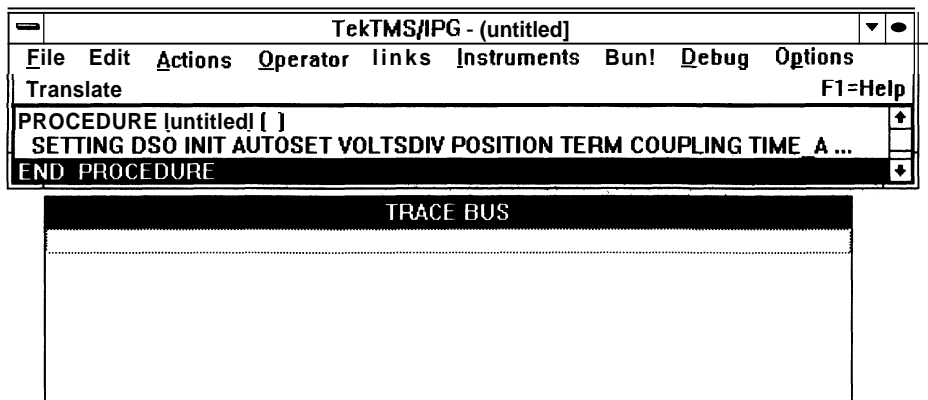
11. If you have the specified oscilloscope connected by a GPIB bus, skip this step and go to Step 13. If not, select **Instruments,** then select **E**mulate.... causing the Emulate Options dialog box (shown in the following illustration) to appear.

```
┌─────────────────────────────────────────────────────────────┐
│ ▬   │           TekTMS/IPG - (untitled)          │ ▼ │ ▲ │
├─────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                    F1=Help │
├─────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) ( )                                        ↑ │
│  SETTING DSO INIT AUTOSET VOLTSDIV POSITION TERM COUPLING TIME_A ... │
│ END  PROCEDURE                                                  ↓ │
└─────────────────────────────────────────────────────────────┘
              ┌───────────────────────────────────────────┐
              │                TRACE BUS                    │
              ├───────────────────────────────────────────┤
              │      ┌──────────────────────────────┐       │
              │      │        EMULATE OPTIONS        │       │
              │      ├──────────────────────────────┤       │
              │      │   □ Emulation on              │       │
              │      │   □ Read from file            │       │
              │      │   ┌──────────────────────┐    │       │
              │      │   │                      │    │       │
              │      │   └──────────────────────┘    │       │
              │      │   ┌──────┐      ┌────────┐    │       │
              │      │   │  OK  │      │ Cancel │    │       │
              │      │   └──────┘      └────────┘    │       │
              │      └──────────────────────────────┘       │
              └───────────────────────────────────────────┘
```
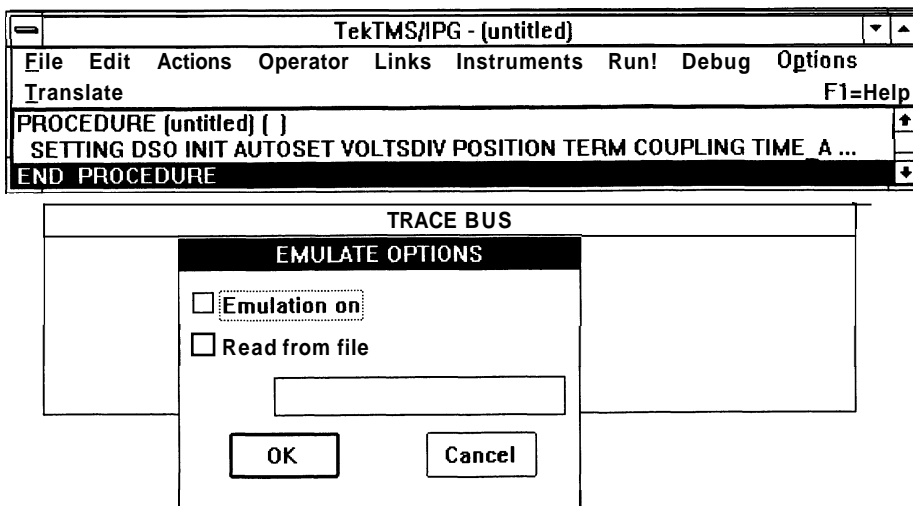
12. Click the mouse on **Emulation On** until an "x" appears in the check box, then select **OK** to return to the Main Menu.

13. Select **Run!.** Bus communications data will appear in the Trace message box, as shown in the following illustration. (Notice the scroll bar that has appeared on the right side of the Trace box, allowing you to scroll the data.) If you have an oscilloscope connected, the control settings on the scope will change to what you specified in the setting step.

```
┌─────────────────────────────────────────────────────────────┐
│ ▬   │           TekTMS/IPG - (untitled)          │ ▼ │ ▲ │
├─────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                    F1=Help │
├─────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) ( )                                        ↑ │
│  SETTING DSO INIT AUTOSET VOLTSDIV POSITION TERM COUPLING TIME_A ... │
│ END  PROCEDURE                                                  ↓ │
└─────────────────────────────────────────────────────────────┘
         ┌───────────────────────────────────────────────┐
         │                  TRACE BUS                      │
         ├───────────────────────────────────────────────┤
         │ GPIB0 -> DSO "CH1 POS:1.000000E+000"        ↑ │
         │ GPIB0 -> DSO "CH1 FIF:OFF"                    │
         │ GPIB0 -> DSO "CH1 COU:DC"                     │
         │ GPIB0 -> DSO "HOR ASE:5E-1"                   │
         │ GPIB0 -> DSO "ATR POS:1.400000E+001"          │
         │ GPIB0 -> DSO "ATR LEV:2.000000E+000"        │
         │                                              ↓ │
         └───────────────────────────────────────────────┘
```

Creating and Editing Test Procedures

14. If you want to make further changes to the settings, point and double-click the mouse on the SETTING step in your procedure. This will cause the instrument front panel view to return, allowing you to change settings. When you save the settings, the Trace box will show the bus communications that transpired, and the scope controls (if a scope is connected) will change to the new settings.

To exit this procedure and return to a normal Main Menu window, first select Debug, then select Trace Bus. This will turn the Trace box off. Select **Instru**ments, then select Emulate**....** Click the mouse on Emulation On until the "x" disappears from the check box. Select OK to return top the Main Menu. Resize the IPG Main Menu window to normal.

Test Procedure Number 5

In this test procedure, we will use an instrument front panel driver to make measurements and acquire waveforms. You will need the oscilloscope listed in *Assumptions,* at the beginning of this section, to run this procedure. However, you do not need the oscilloscope to create the test procedure

1. Select New from the Main Menu bar, then select Instruments. Choose Select from the Instrument Menu, causing the instrument Select dialog box to appear. Double-click the mouse on 2400dso.isd in the list box. This will cause the driver file name and the type of port to appear in the Drivers: and **Port:** edit boxes. Enter the primary address (in the range of 0–29) in the Address: edit box (enter *0* if you do not have the oscilloscope connected), then enter DSO in the **TMS** Name: edit box. Select Add to add the driver to the list box at the top of the dialog box. Select OK to complete the operation and return to the Main Menu.

2. Select Instruments, then **View** and then DSO. When the instrument front panel view appears, select Views, causing the menu list shown in the following illustration to appear.
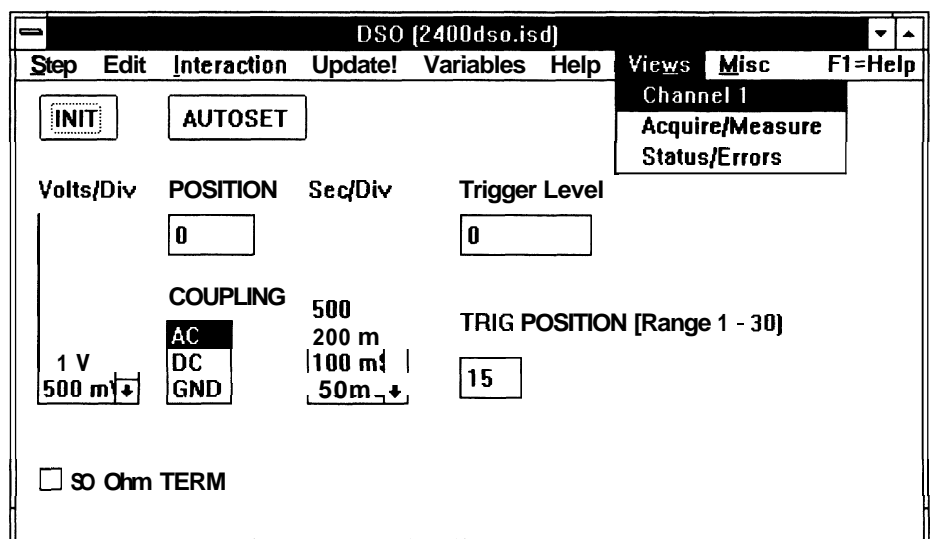
3. Select **Acquire/Measure**, causing the Acquire/Measure window (shown in the following illustration to appear).
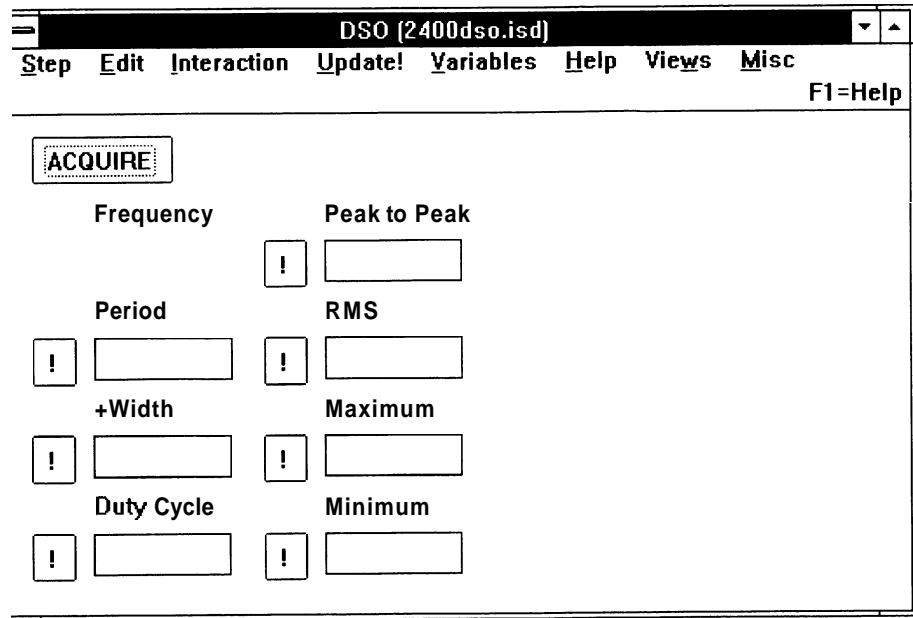
4. Move the mouse pointer to the **Frequency** text box and click the mouse. This will cause **Frequency** to become the selected (focused) control, and will place a blinking cursor (shown in the following illustration) in the **Frequency** text box.
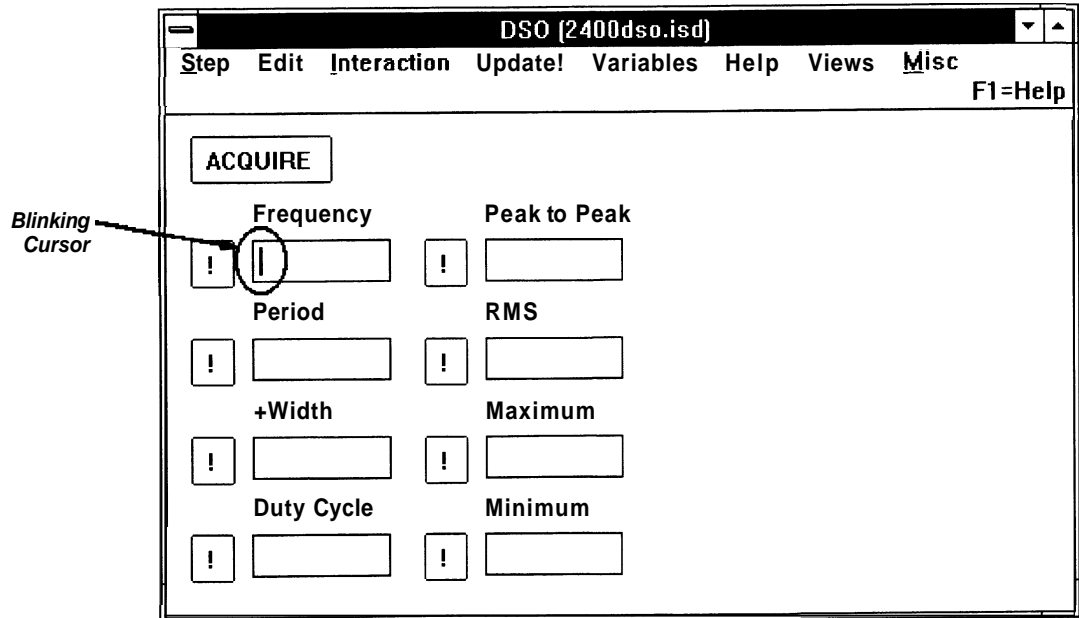
5. Select **Variables**, causing the menu list shown in the following illustration to appear.

```
┌───────────────────────────────────────────────────────────────────┐
│ ▬                        DSO (2400dso.isd)                    ▼ ▲ │
│ Step  Edit  Interaction  Update!  Variables  Help  Views  Misc     │
│                                   Current Control...      F1=Help  │
│ ┌─────────────────────────────────Current View...──────────────┐  │
│ │  ┌──────────┐                                                 │  │
│ │  │ ACQUIRE  │                                                 │  │
│ │  └──────────┘                                                 │  │
│ │        Frequency            Peak to Peak                      │  │
│ │   ┌─┐ ┌──────────┐     ┌─┐ ┌──────────┐                       │  │
│ │   │!│ │          │     │!│ │          │                       │  │
│ │   └─┘ └──────────┘     └─┘ └──────────┘                       │  │
│ │        Period               RMS                              │  │
│ │   ┌─┐ ┌──────────┐     ┌─┐ ┌──────────┐                       │  │
│ │   │!│ │          │     │!│ │          │                       │  │
│ │   └─┘ └──────────┘     └─┘ └──────────┘                       │  │
│ │        +Width               Maximum                          │  │
│ │   ┌─┐ ┌──────────┐     ┌─┐ ┌──────────┐                       │  │
│ │   │!│ │          │     │!│ │          │                       │  │
│ │   └─┘ └──────────┘     └─┘ └──────────┘                       │  │
│ │        Duty Cycle           Minimum                          │  │
│ │   ┌─┐ ┌──────────┐     ┌─┐ ┌──────────┐                       │  │
│ │   │!│ │          │     │!│ │          │                       │  │
│ │   └─┘ └──────────┘     └─┘ └──────────┘                       │  │
│ └───────────────────────────────────────────────────────────────┘  │
└───────────────────────────────────────────────────────────────────┘
```
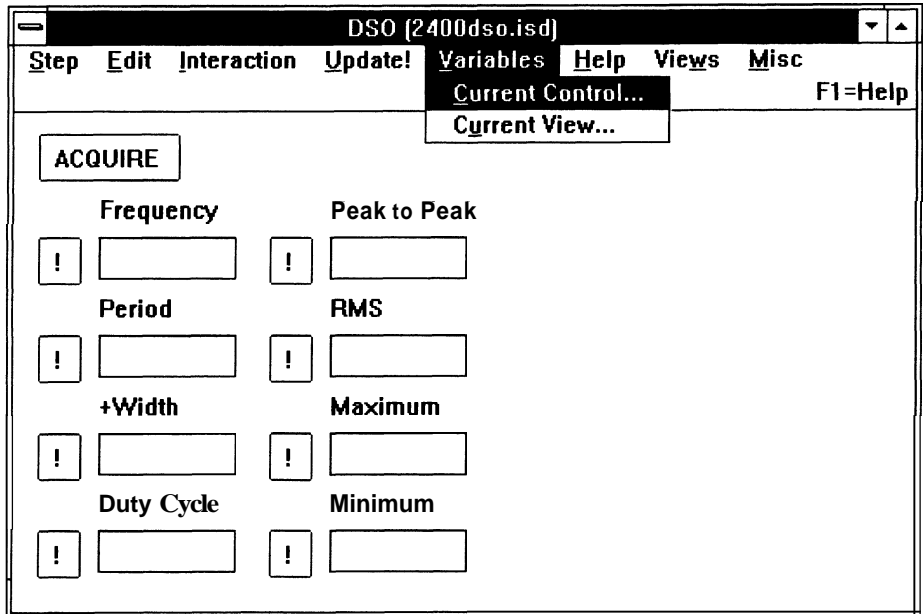
6. Select **current Control...**, causing the dialog box shown in the following illustration to appear.

```
┌─────────────────────────────────────────────────┐
│                   VARIABLE                       │
│ Edit                                             │
├─────────────────────────────────────────────────┤
│ Control Id:    FREQ                              │
│ Variable:    ┌──────────────────────────────┐ ┌┐ │
│              │ myfreq                       │ │↑│ │
│              └──────────────────────────────┘ └┘ │
│         ┌──────────┐        ┌──────────┐         │
│         │   OK     │        │  Cancel  │         │
│         └──────────┘        └──────────┘         │
└─────────────────────────────────────────────────┘
```
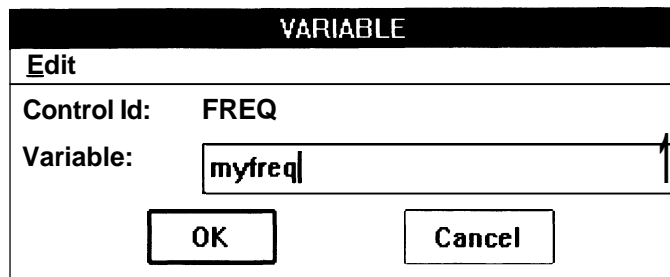
7. Notice that the **Control Id:** edit control box already contains FREQ. This is because we selected **Frequency** in Step 4, causing it to become the current control. Enter *myfreq* in the **Variable:** edit box (as shown in the above illustration). Select the **OK** pushbutton to return to the instrument front panel view. Select **Step,** then select **Save Selected Measurements...** causing the dialog box shown in the following illustration to appear.
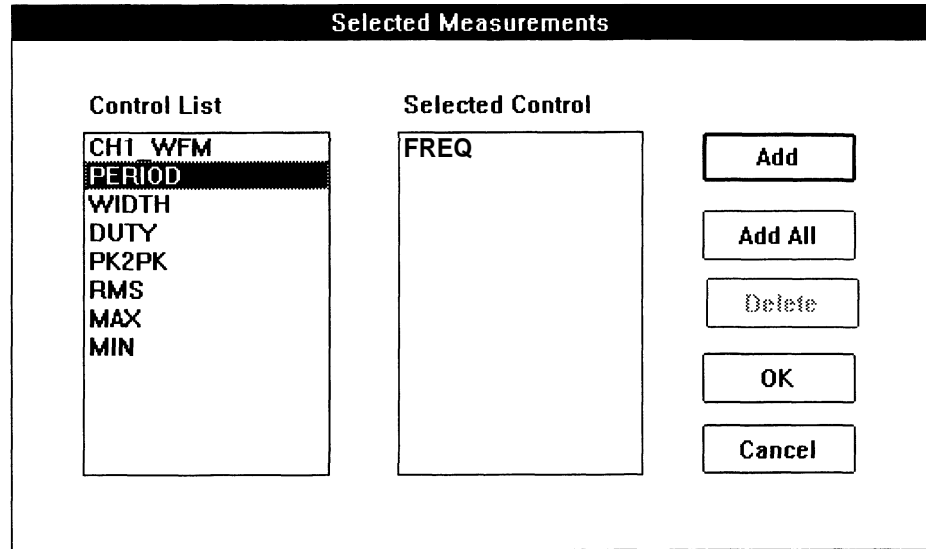
8. Point and click the mouse on FREQ, then select the **Add** pushbutton to add FREQ to the **Selected Control** list (as shown in the above illustration). Select the **OK** pushbutton to return to the instrument front panel view.

9. Minimize the instrument front panel view window by clicking the mouse on the down arrow in the upper right corner of the window. This will create a dso icon at the bottom of the display and return you to the Main Menu. Verify that your display matches the following illustration.
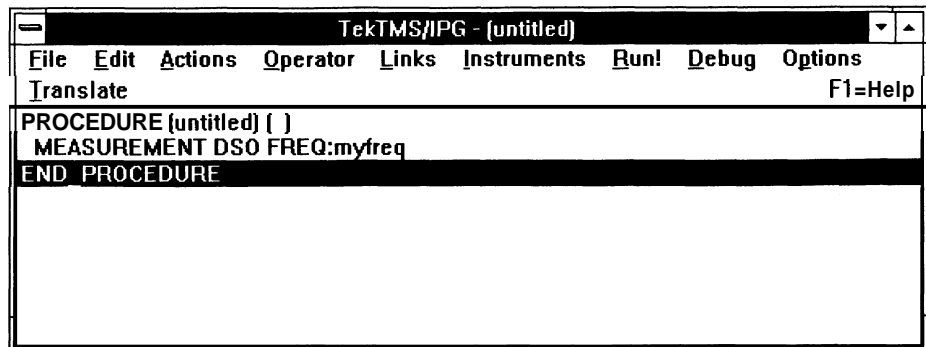
10. Select Operator, select Display Data, then select **Wait....** Enter *myfreq* in the Expression: edit box, then select the **OK** pushbutton to return you to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────┐
│ ▬              TekTMS/IPG - (untitled)                  ▼ ▲  │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                              F1=Help │
├─────────────────────────────────────────────────────────────┤
│ PROCEDURE [untitled] ( )                                      │
│   MEASUREMENT DSO FREQ:myfreq                                 │
│   DISPLAY myfreq                                              │
│ END PROCEDURE                                                │
│                                                              │
│                                                              │
│                                                              │
└─────────────────────────────────────────────────────────────┘
```
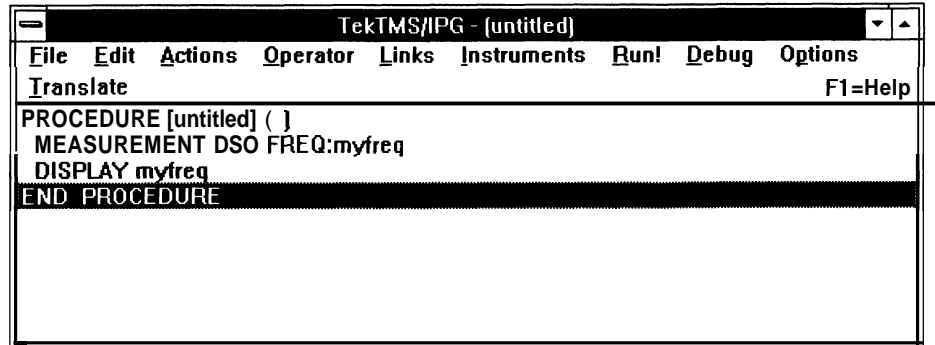
11. Double-click the mouse on the `dso` icon at the bottom of the display to return to the instrument front panel view. Select Variables, then select Current **View...**, to display the dialog box shown in the following illustration.

12. Point and click the mouse on `CH1_WFM` in the ControlId list box, then enter *wfm ~* in the Variable: edit box. Select the Change pushbutton to assign the variable `wfm-` to the `CH1_WFM` control, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────┐
│                    View Variables                        │
├─────────────────────────────────────────────────────────┤
│ Edit                                                     │
├─────────────────────────────────────────────────────────┤
│ ControlId                    Variable                    │
├─────────────────────────────────────────────────────────┤
│ ACQUIRE                                             ▲   │
│ CH1_WFM                      wfm"                       │
│ FRQACQ                                                  │
│ FREQ                         myfreq                     │
│ PERACQ                                                  │
│ PERIOD                                                  │
│ WIDTHACQ                                            ▼   │
├─────────────────────────────────────────────────────────┤
│ ControlId:                   Variable:                   │
│                                                          │
│ CH1_WFM                      │ wfm~              │       │
│                              └───────────────────┘       │
│ ┌─────────┐    ┌────────┐    ┌─────────┐                │
│ │ Change  │    │   OK   │    │ Cancel  │                │
│ └─────────┘    └────────┘    └─────────┘                │
└─────────────────────────────────────────────────────────┘
```
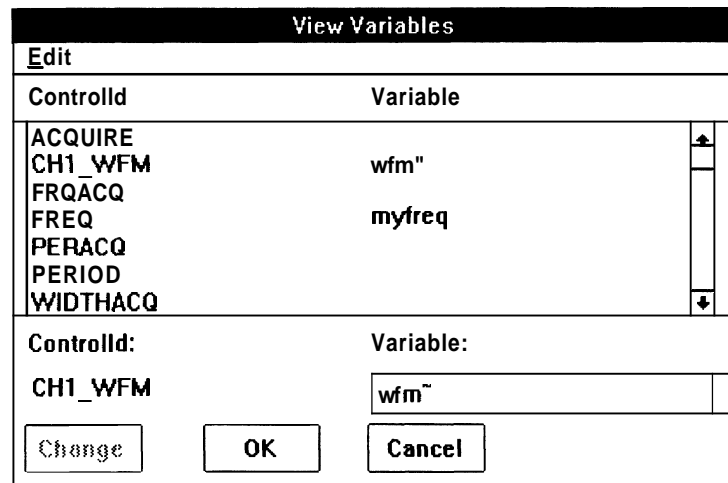
13. Select the **OK** pushbutton to return to the instrument front panel view. Select Step, then Save Selected Measurements**....** Click the mouse on `CH1_WFM` and select Add to add the `CH1_WFM` control to the Selected Control list. Select **OK** to return to the instrument front panel display. Minimize the instrument front panel window and verify that your Main Menu display matches the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - TEST5.PRG                            ▼ ▲     │
├──────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options│
│ Translate                                                      F1=Help │
├──────────────────────────────────────────────────────────────────────┤
│ PROCEDURE TEST5 [ ]                                                    │
│   MEASUREMENT DSO FREQ:myfreq                                          │
│   DISPLAY myfreq                                                       │
│   MEASUREMENT DSO CH1_WFM:wfm~                                         │
│ END_PROCEDURE                                                          │
│                                                                        │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```

14. Select **Operator,** then **Display Waveforms....** Enter *wfm* ~ in the
    Waveform Variable: edit box, then press **Add** to add the variable to the
    Selected Waveforms list, finally select the OK pushbutton to return to
    the Main Menu. Verify that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - [untitled]                           ▼ ▲     │
├──────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options│
│ Translate                                                      F1=Help │
├──────────────────────────────────────────────────────────────────────┤
│ PROCEDURE [untitled] [ ]                                               │
│   MEASUREMENT DSO FREQ:myfreq                                          │
│   DISPLAY myfreq                                                       │
│   MEASUREMENT DSO CH1_WFM:wfm~                                         │
│   DISPLAY WAVEFORMS wfm~                                               │
│                                                                        │
│                                                                        │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```

15. Select **File,** then **Save as...**. Enter test5 in the **Save File As:** edit box.
    Select **Save** to save the program and return to the Main Menu. Verify
    that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - TEST5.PRG                            ▼ ▲     │
├──────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options│
│ Translate                                                      F1=Help │
├──────────────────────────────────────────────────────────────────────┤
│ PROCEDURE TEST5 [ ]                                                    │
│   MEASUREMENT DSO FREQ:myfreq                                          │
│   DISPLAY myfreq                                                       │
│   MEASUREMENT DSO CH1_WFM:wfm~                                         │
│   DISPLAY WAVEFORMS wfm~                                               │
│ END_PROCEDURE                                                          │
│                                                                        │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```

16. Select **Debug,** then **Trace Bus.** The Trace box will appear. Click the mouse on the title bar and drag the Trace box to the lower portion of the display area. Select **Instruments,** then **Emulate....** Click the mouse on **Emulation On** until the "x" in the check box disappears (emulation turned off). Select **OK** to return to the Main Menu. To run the procedure, select **Run!.** When the test procedure is running, you will be able to display the waveform currently being measured on Channel 1 of the oscilloscope, as well as monitoring the GPIB bus communications in the Trace box. Refer to the Waveform tutorial in Section 6 for more information on the waveform display and Waveform Menu.

Editing a Test Procedure

This section contains tutorials to demonstrate the editing features of IPG. Since the DEMOTEST.PRG procedure already exists on the IPG program disks, we will use a copy of it as the base procedure for editing. Before beginning the tutorials, create a copy of DEMOTEST.PRG named EDIT-TEST.PRG. Then start IPG, and open the EDITTESTPRG file.

Editing Overview

Appendix A, Editing Commands, contains a reference list of all editing commands, with a definition of each command and its action. The commands and their descriptions are also given in the following editing examples.

To demonstrate editing, we will first add two slightly modified duplicates of existing steps to the base procedure. By adding steps that are nearly duplicates, we can reinforce how to create the steps as well as provide a method of differentiating between the original steps and the added ones. We will then edit the added steps using the Edit Menu (selected from the Main Menu bar). (The Edit Menu, when selected from the Main Menu bar, acts only on an entire step.) Next we will edit individual items within a step using the Edit Menu selected through the dialog boxes and the keyboard keys. (When the Edit Menu is selected in this manner, it allows us to edit individual items in the steps.) Finally, we will delete all the steps added during the tutorial.

Multiple Statement Editing

When some steps are created in a procedure, they create multiple statement lines (e.g., an ADJUSTMENT step creates ADJUSTMENT and END-ADJUSTMENT statements, while a FOR-NEXT step creates FOR and NEXT statements). Once these boundary statements are created, additional separate steps can be created between them. Editing functions in IPG allow users to simultaneously execute editing functions on boundary statements by highlighting either boundary statement, then selecting the editing command. However, separately created statements that are placed between the boundary statements are untouched by the editing actions on the boundary statements unless Multiple Step Highlighting is used.

Multiple Step Highlighting — Multiple step highlighting occurs when you highlight one or more procedure steps using the SHIFT or CTRL keys and the mouse.

To highlight a contiguous group of procedure steps, point and click on the top step in the group. Then, while holding the SHIFT key down, click the mouse on the last step in the group you want to highlight. You can also click the mouse on the first step, and, while holding the mouse button, drag the mouse to the last step you want to highlight.
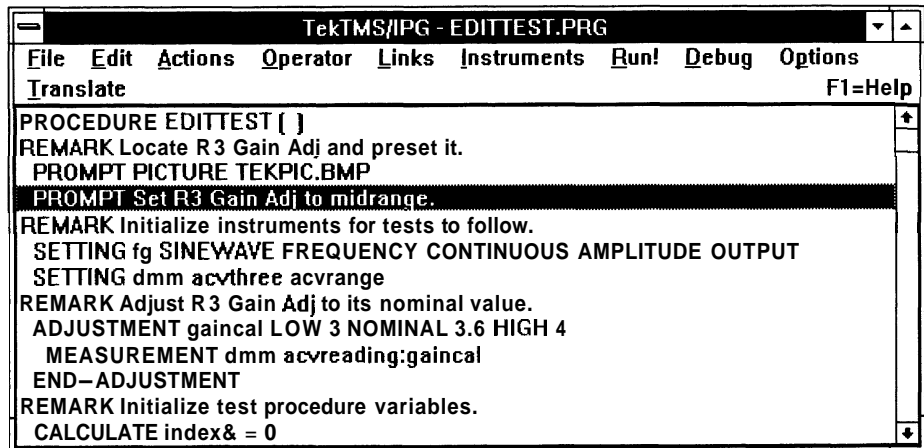
To highlight noncontiguous steps, hold the CTRL key down while you click the mouse on each step you want to highlight.

Adding Steps to a Test Procedure

When you add a step to an existing test procedure, IPG inserts the step immediately above the currently highlighted step. (To highlight a step, point and click the mouse on it.)

We will add a step to the EDITTEST.PRG procedure as follows:

1. Point and click the mouse on the procedure statement PROMPT Set R3 Gain Adj to midrange, as shown in the following illustration.

```
┌──────────────────────────────────────────────────────────────────┐
│ ▭           TekTMS/IPG - EDITTEST.PRG                      ▼ ▲ │
├──────────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                      F1=Help │
├──────────────────────────────────────────────────────────────────┤
│ PROCEDURE EDITTEST [ ]                                           ▲ │
│ REMARK Locate R 3 Gain Adj and preset it.                         │
│   PROMPT PICTURE TEKPIC.BMP                                        │
│ ▓PROMPT Set R3 Gain Adj to midrange.▓                             │
│ REMARK Initialize instruments for tests to follow.                │
│   SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT        │
│   SETTING dmm acvthree acvrange                                    │
│ REMARK Adjust R 3 Gain Adj to its nominal value.                  │
│   ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                      │
│     MEASUREMENT dmm acvreading:gaincal                             │
│   END-ADJUSTMENT                                                   │
│ REMARK Initialize test procedure variables.                       │
│   CALCULATE index& = 0                                           ▼ │
└──────────────────────────────────────────────────────────────────┘
```

2. Select **Operator** from the Main Menu bar. When the Operator Menu appears, select **Prompt...**, then select **Text....** When the Text Prompt dialog box appears, enter Set the Gain *Adj* control R3 to midrange. in the **Message:** edit box. Leave the **Variable:** edit box blank. Select the OK pushbutton to return to the main menu. The procedure will now have a slightly modified duplicate Prompt line above the original Prompt line, as shown in the following illustration.

```
━  TekTMS/IPG - EDITTEST.PRG                       ▼ ▲
File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options
Translate                                                      F1=Help
PROCEDURE EDITTEST ( )                                              ✦
REMARK Locate R3 Gain Adj and preset it.
  PROMPT PICTURE TEKPIC.BMP
  PROMPT Set the Gain Adj control R3 to midrange.
  PROMPT Set R3 Gain Adj to midrange.
REMARK Initialize instruments for tests to follow.
  SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT
  SETTING dmm acvthree acvrange
REMARK Adjust R3 Gain Adj to its nominal value.
  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4
    MEASUREMENT dmm acvreading:gaincal
  END–ADJUSTMENT
REMARK Initialize test procedure variables.                        ↓
```

We will now add a second step to the procedure:

1. Point and click the mouse on the procedure statement ADJUSTMENT
    gaincal LOW 3 NOMINAL 3.6 HIGH 4.

2. Select Operator from the Main Menu bar. When the Operator Menu
    appears, select Adjustment... After the Adjustment dialog box appears,
    enter 5 in the Lower Limit: edit box, 5.5 in the Nominal Value: edit box,
    and 6 in the Upper Limit: edit box. Enter calval in the Variable: edit box;
    leave the **Pass/Fail:** and Message: edit boxes blank. Select the **OK**
    pushbutton to return to the Main Menu. The procedure will now have
    new ADJUSTMENT and END–ADJUSTMENT statement lines above the
    original ADJUSTMENT statement line, as shown in the following illustra-
    tion.

```
━  TekTMS/IPG - EDITTEST.PRG                        ▼ ▲
File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options
Translate                                                      F I=Help
  PROMPT Set the Gain Adj control R3 to midrange.                  ✦
  PROMPT Set R3 Gain Adj to midrange.
REMARK Initialize instruments for tests to follow.
  SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT
  SETTING dmm acvthree acvrange
REMARK Adjust R3 Gain Adj to its nominal value.
  ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6
  END_ADJUSTMENT
  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4
    MEASUREMENT dmm acvreading:gaincal
  END–ADJUSTMENT
REMARK Initialize test procedure variables.
  CALCULATE index& = 0                                             ↓
```

We will now add a MEASUREMENT step between the new ADJUSTMENT and END-ADJUSTMENT statements:

1. Point and click the mouse on the procedure statement MEASUREMENT dmm acvreading:gaincal in the original procedure.

2. Select **Edit** from the Main Menu bar. When the Edit Menu appears, select **Copy.** After the procedure display returns, point and click on the END-ADJUSTMENT statement following the ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6 statement.

3. Select **Edit.** When the Edit Menu appears, select **Paste.** After the procedure display returns, the MEASUREMENT step will be displayed between the ADJUSTMENT and END-ADJUSTMENT statements of the added Adjustment step, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬         TekTMS/IPG - EDITTEST.PRG                      ▼ ▲ │
├─────────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                    F1=Help │
│  PROMPT Set the Gain Adj control R3 to midrange.              ▲ │
│  PROMPT Set R3 Gain Adj to midrange.                           │
│ REMARK Initialize instruments for tests to follow.             │
│  SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT     │
│  SETTING dmm acvthree acvrange                                 │
│ REMARK Adjust R3 Gain Adj to its nominal value.                │
│  ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                     │
│    MEASUREMENT dmm acvreading:gaincal                          │
│  END_ADJUSTMENT                                                │
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                   │
│    MEASUREMENT dmm acvreading:gaincal                          │
│  END_ADJUSTMENT                                                │
│ REMARK Initialize test procedure variables.                  ▼ │
└─────────────────────────────────────────────────────────────────┘
```

We will now change the variable gaincal to calval, to match the new ADJUSTMENT step. To change the variable:

1. Point and double-click the mouse on the added MEASUREMENT Step. After the Instrument Front Panel view appears, point and click the mouse on the **Measurement** edit box, causing a blinking cursor to appear in the box.

2. Select **Variables.** When the Variables Menu appears, select **Current View.** After the dialog box, click on *gaincal* to select it. Then replace *gaincal* with *calval* in the **Variable** edit box and press the **Change** button to change the list entry. Select the **OK** pushbutton. When the Instrument Front Panel view returns, select **Step.** After the Step Menu appears, select **Save Selected Measurements....** When the Selected Measurements dialog box appears, acvreading should appear in the **Selected Control** list box. (If it does not appear in the list box, point and click on it in the **Control List** list box and select the **Add** pushbutton.) Select the **OK** pushbutton to change the variable in the step and return to the Main Menu. The added MEASUREMENT statement will now read MEASUREMENT dmm acvreading: calval, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬          TekTMS/IPG - EDITTEST.PRG              ▼ ▲ │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                F1=Help │
│  PROMPT Set the Gain Adj control R3 to midrange.              ▲  │
│  PROMPT Set R3 Gain Adj to midrange.                            │
│ REMARK Initialize instruments for tests to follow.             │
│   SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT     │
│   SETTING dmm acvthree acvrange                                 │
│ REMARK Adjust R3 Gain Adj to its nominal value.                │
│  ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                     │
│ ▓▓▓▓▓MEASUREMENT dmm acvreading:calval▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓  │
│  END_ADJUSTMENT                                                 │
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                    │
│    MEASUREMENT dmm acvreading:gaincal                           │
│  END–ADJUSTMENT                                                 │
│ REMARK Initialize test procedure variables.                    │
│  CALCULATE index& = 0                                           │
│  CALCULATE testdatetime$ = date$0+" "+time$0              ▼  │
└─────────────────────────────────────────────────────────────────┘
```

Editing Steps with the Edit Menu Commands

When you select **Edit** from the Main Menu bar, the Edit Menu items act only on an entire highlighted step. When a procedure is displayed on-screen, at least one procedure line is always highlighted.

If no previous editing action has taken place when you select **Edit** from the Main Menu bar, the Edit Menu appears with all items active, except **Paste.** (When a menu item is not active, it will be displayed in gray.) **Paste** is active only after a **Cut** or **Copy** has been used to place test steps on the clipboard.

Editing a Single Statement Procedure Step — The first added PROMPT procedure step involved adding a single statement step. To edit that step from the Main Menu, do the following:

1. Point and click the mouse on the procedure statement PROMPT Set the Gain Adj control R3 to midrange.

2. Select **Edit** from the Main Menu bar. When the Edit Menu appears, select **Cut.** After the procedure display returns, the PROMPT step will have been deleted.

3. Select **Edit** again. When the Edit Menu appears, select **Undo**. After the procedure display returns, the deleted PROMPT step will have been returned to its original position in the procedure.

4. Select **Edit** again. When the Edit Menu appears, select **Copy.** After the procedure display returns, select **Edit.** When the Edit Menu appears, notice that the **Paste** menu item is no longer displayed in gray (it is now active). Select **Paste.** When the procedure display returns, a duplicate step will have been copied into the procedure, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - EDITTEST.PRG                      ▼ ▲       │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options│
│ Translate                                              F1=Help       │
│ PROCEDURE EDITTEST [ ]                                          ◆    │
│ REMARK Locate R3 Gain Adj and preset it.                            │
│   PROMPT PICTURE TEKPIC.BMP                                         │
│   PROMPT Set the Gain Adj control R3 to midrange.                   │
│  PROMPT Set the Gain Adj control R3 to midrange.                    │
│   PROMPT Set R3 Gain Adj to midrange.                               │
│ REMARK Initialize instruments for tests to follow.                  │
│   SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT          │
│   SETTING drnm acvthree acvrange                                    │
│ REMARK Adjust R3 Gain Adj to its nominal value.                     │
│   ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                         │
│     MEASUREMENT drnrn acvreading:calval                             │
│   END−ADJUSTMENT                                                    │
│   ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                        │
│   MEASUREMENT dmm acvreading:gaincal                           ▼    │
└─────────────────────────────────────────────────────────────────────┘
```

5. Point and click the mouse on the original `PROMPT` statement: `PROMPT Set R3 Gain Adj to midrange.`

6. Select **Edit** from the Main Menu bar. When the Edit Menu appears, select **Cut.** After the procedure display returns, the original `PROMPT` statement will have been deleted.

7. Point and click the mouse on one of the added `PROMPT Set the Gain Adj control R3 to midrange` statements.

8. Select **Edit**. When the Edit Menu appears, select **Clear.** After the procedure display appears, one copy of the added `PROMPT` Statements will have been deleted. **(Clear** deletes a step, but does not change the contents of the **Cut/Paste/Copy** clipboard.)

9. Point and click the mouse on the procedure statement `PROMPT PIC-TURE TEKPIC.BMP`.

10. Select Edit. When the Edit Menu appears, select Paste. After the procedure display returns, notice that the PROMPT line deleted in Step 6 has returned, as shown in the following illustration. This verifies that Clear deletes a step, without changing what was on the clipboard before Clear was selected.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▬            TekTMS/IPG - EDITTEST.PRG                         ▼ ▲    │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options│
│ Translate                                                      F1=Help │
├────────────────────────────────────────────────────────────────── ▲ ─┤
│ PROCEDURE EDITTEST [ ]                                                 │
│ REMARK Locate R3 Gain Adj and preset it.                              │
│  PROMPT Set R3 Gain Adj to midrange.                                  │
│  PROMPT PICTURE TEKPIC.BMP                                            │
│  PROMPT Set the Gain Adj control R3 to midrange.                      │
│ REMARK Initialize instruments for tests to follow.                    │
│  SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT             │
│  SETTING dmm acvthree acvrange                                        │
│ REMARK Adjust R3 Gain Adj to its nominal value.                       │
│  ADJUSTMENT calval LOW 5 NOMINAL 5.5  HIGH 6                          │
│   MEASUREMENT dmm acvreading:calval                                  │
│  END-ADJUSTMENT                                                       │
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                          │
│   MEASUREMENT dmm acvreading:gaincal                             ▼    │
└──────────────────────────────────────────────────────────────────────┘
```

Editing a Multiple Statement Procedure Step — We have already added a second ADJUSTMENT procedure step containing ADJUSTMENT and END-ADJUSTMENT statements. Editing this step is similar to editing a single statement step, with the following exceptions:

■ When you select any one of the statements in a multiple statement step, and then select an edit action (Undo, Cut, Copy, Paste, or Clear), that action occurs for all the statements in the step, but not for separate steps between the boundary statements.

■ The separate steps created between the boundary statements of a multiple statement step can be edited in one of two ways:

a. They can be edited separately like any other single or multiple statement step.

OR

b. They can be edited at the same time as the multiple statement step by using multiple step highlighting.

To edit the ADJUSTMENT step, perform the following:

1. Point and click the mouse on the added ADJUSTMENT statement.

2. Select **Edit.** When the Edit Menu appears, select **Cut.** After the procedure display returns, you will notice that the ADJUSTMENT and END-ADJUSTMENT statements have been deleted, but the MEASUREMENT statement remains, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - EDITTEST.PRG                          ▼│▲ │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                        F1=Help │
├─────────────────────────────────────────────────────────────────────────┤
│PROCEDURE EDITTEST [ ]                                                    ✦│
│REMARK Locate R3 Gain Adj and preset it.                                   │
│ PROMPT Set R3 Gain Adj to midrange.                                       │
│ PROMPT PICTURE TEKPIC.BMP                                                 │
│ PROMPT Set the Gain Adj control R3 to midrange.                           │
│REMARK Initialize instruments for tests to follow.                         │
│ SEITING fg SINEWAVE FREQUENCYCONTINUOUS AMPLITUDE OUTPUT                   │
│ SETTING dmm acvthree acvrange                                             │
│REMARK Adjust R3 Gain Adj to its nominal value.                            │
│ MEASUREMENT dmm acvreading:calval                                         │
│ ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                               │
│   MEASUREMENTdmrn acvreading:gaincal                                      │
│ END-ADJUSTMENT                                                            │
│REMARK Initialize test procedure variables.                               ✦│
└─────────────────────────────────────────────────────────────────────────┘
```

3. Select **Edit.** When the Edit Menu appears, select **Undo.** After the procedure display returns, the ADJUSTMENT and END-ADJUSTMENT Statements will have returned to the procedure, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - EDITTEST.PRG                          ▼│▲ │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                        F1=Help │
├─────────────────────────────────────────────────────────────────────────┤
│ PROMPT Set R3 Gain Adj to midrange.                                      ✦│
│ PROMPT PICTURE TEKPIC.BMP                                                 │
│ PROMPT Set the Gain Adj control R3 to midrange.                           │
│REMARK Initialize instruments for tests to follow.                         │
│ SEITING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT                  │
│ SETTING dmm acvthree acvrange                                             │
│REMARK Adjust R3 Gain Adj to its nominal value.                            │
│ ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                                │
│   MEASUREMENT dmm acvreading:calval                                       │
│ END-ADJUSTMENT                                                            │
│ ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                               │
│   MEASUREMENT dmm acvreading:gaincal                                      │
│ END_ADJUSTMENT                                                            │
│REMARK Initialize test procedure variables.                               ✦│
└─────────────────────────────────────────────────────────────────────────┘
```

4. Point and click the mouse on the added ADJUSTMENT statement to highlight it. Move the mouse cursor to the MEASUREMENT statement. While holding the SHIFT key down, click and drag the mouse to highlight the MEASUREMENT and END-ADJUSTMENT statements.

---

5. Select **Edit.** When the Edit Menu appears, select **Copy.** After the proce-
   dure display returns, select **Edit** again. When the Edit Menu appears,
   select **paste.** When the procedure display returns, the ADJUSTMENT ,the
   END-ADJUSTMENT , and the MEASUREMENT statements will have been
   copied into the procedure, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬            TekTMS/IPG - EDITTEST.PRG                          ▼ ▲   │
├─────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options│
│ Translate                                                    F1=Help  │
├─────────────────────────────────────────────────────────────────────┤
│  PROMPT PICTURE TEKPIC.BMP                                       ▲    │
│  PROMPT Set the Gain Adj control R3 to midrange.                      │
│ REMARK Initialize instruments for tests to follow.                    │
│  SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT            │
│  SETTING dmm acvthree acvrange                                        │
│ REMARK Adjust R3 Gain Adj to its nominal value.                       │
│  ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                           │
│    MEASUREMENT dmm acvreading:calval                                  │
│  END_ADJUSTMENT                                                       │
│  ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                           │
│    MEASUREMENT dmm acvreading:calval                                  │
│  END-ADJUSTMENT                                                       │
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                          │
│    MEASUREMENT dmm acvreading:gaincal                            ▼    │
└─────────────────────────────────────────────────────────────────────┘
```

Editing Items in a Dialog Box

When you use the Edit Menu items from a dialog box, you have the means
to edit the individual items that make up a step. While you are in a dialog
box, the items can also be edited by using the BACKSPACE, DEL, and
alphanumeric/symbol keys.

Dialog Box Editing Using Edit Menu Commands — To edit the added
PROMPT statement with the dialog box Edit Menu, perform the following:

1. Double-click the mouse on the procedure statement PROMPT Set the
   Gain Adj control R3 to midrange.The Text Prompt dialog box
   will appear.

2. Point the mouse to the beginning of the text line in the **Message:** edit
   control box. Then click and drag the mouse to the right end of the
   message (including the period) and release the mouse button. This will
   highlight the message.

3. Select **Edit** from the dialog box menu bar. After the Edit Menu appears,
   select **Cut.** When the dialog box returns, the message will be deleted.

4. Select **Edit** from the dialog box menu bar. After the Edit Menu appears,
   select **Undo.** When the dialog box returns, the message will have re-
   turned to its original position.

5. Point the mouse to the beginning of the text Gain Adj control ,then
   click and drag the mouse to the beginning of the word R3 (include the
   space after the word control) and release the mouse button. This will
   highlight the selected part of the message.

6. Select **Edit.** When the Edit Menu appears, select **Copy.** After the dialog box returns, point and click the mouse to the beginning of the word `to`, locating a blinking cursor at that point.

7. Select **Edit.** After the Edit Menu appears, select **Paste.** When the dialog box returns, the copied text will appear both before and after the word `R3`, as shown in the following illustration.
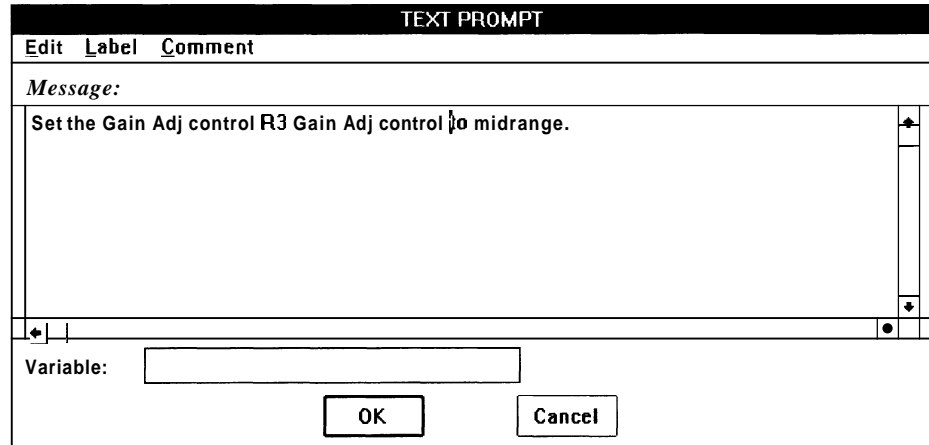
8. Point the mouse to the beginning of the first appearance of the text `Gain Adj control`, then click and drag the mouse to the beginning of the word `R3` (include the space after the word `control`) and release the mouse button. This will highlight the selected part of the message.

9. Select **Edit,** then select **Cut.** When the dialog box returns, the high-lighted text will be deleted.

10. Point the mouse to the beginning of the word `R3`, then click and drag the mouse to the beginning of the word `to` (including the space after the word `control`) and release the mouse button. This will highlight the selected text.

11. Select **Edit,** then select **Clear.** When the dialog box returns, the pre-viously highlighted text will be deleted.

12. Point and click on the beginning of the word `to`, if the cursor is not already at that point. Select **Edit,** then select **Paste.** When the dialog box returns, the text highlighted in Step 8 and cut in Step 9 will appear in the message. (This is the case because the **Clear** in Step 11 did not change the contents of the **Cut/Paste/Copy** clipboard.

13. Select the **OK** pushbutton to change the step and return to the proce-dure display. Verify that your display matches the following illustration.

Using the Keyboard Keys to Edit a Dialog Box — We will use the added PROMPT statement In this demonstration of keyboard key editing in a dialog box. To edit the dialog box associated with the added PROMPT statement, perform the following:

1. Point and double-click the mouse on the added statement PROMPT Set the Gain Adj control to midrange. After the second click of the mouse button, the entire test procedure will be displayed in gray and the dialog box used to create the PROMPT step will appear.

2. Point and click the mouse at the beginning of the word the. This will cause a blinking cursor to appear.

3. Press the DEL key enough times to delete all characters through the word control and the space following. Each time you press the DEL key, a character or space will be removed from the message text.

4. Enter R3 and press the SPACE BAR. The word R3 will now appear between the words Set and to.

5. Select the **OK** pushbutton. When the procedure display returns, the added PROMPT statement will now read PROMPT Set R3 to midrange, as shown in the following illustration.

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬            TekTMS/IPG - EDITTEST.PRG                    ▼ ▲      │
├───────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                               F1=Help   │
├───────────────────────────────────────────────────────────────────┤
│ PROCEDURE EDITTEST [ ]                                        ▲   │
│ REMARK Locate R3 Gain Adj and preset it.                          │
│   PROMPT Set R3 Gain Adj to midrange.                             │
│   PROMPT PICTURE TEKPIC.BMP                                       │
│   PROMPT Set R3 to midrange.                                      │
│ REMARK Initialize instruments for tests to follow.                │
│   SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT        │
│   SETTING dmm acvthree acvrange                                   │
│ REMARK Adjust R3 Gain Adj to its nominal value.                   │
│   ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                       │
│     MEASUREMENT dmm acvreading:calval                             │
│   END–ADJUSTMENT                                                  │
│   ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6                       │
│     MEASUREMENT dmm acvreading:calval                             │
└───────────────────────────────────────────────────────────────────┘
```

Deleting the Added Steps from the Test Procedure

We will now delete all the statements added during the previous editing demonstrations. To delete these statements:

1. Point and click the mouse on the statement PROMPT Set R3 to midrange to highlight it. While holding the CTRL key down, point and click the mouse on all other statements that we added. (Besides the added PROMPT, There should be one ADJUSTMENT calval LOW 5 NOMINAL 5.6 HIGH 6 and two MEASUREMENT dmm acvreading:calval steps to delete.)

2. Select **Edit** from the Main Menu bar. When the Edit Menu appears, select **Clear.** After the procedure display returns, the statements will be deleted.

Editing a Step with an Instrument Front Panel View

Opening an instrument front panel view for editing is no different from opening any other step for editing. Simply double-click the mouse on the step you wish to edit. When the front panel view appears, it is opened as a window rather than a dialog box. Although the down arrow (minimize arrow) in the upper right corner of the window is not displayed in gray, it is disabled while the front panel view is in the editing mode. (this terminates when a **Step** menu item is selected). The up arrow (maximize arrow) functions normally.

Adding a Label to a Step

Labels are required on steps where program flow control is transferred with a GOTO or GOSUB step created through the Actions Menu. In this demonstration, we will add a label to the ADJUSTMENT step in the original procedure. There are two ways to add labels to test steps.

1. To use the first way to add the label, perform the following:

   a. Point and double-click the mouse on the procedure statement ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4. The dialog box used to create the step will appear.

   b. Select **label.** When the Label dialog box appears, enter *adj1* in the edit control box.

   c. Select the OK pushbutton. When the Adjustment dialog box returns, select its **OK** pushbutton to add the label and return to the procedure display. Notice that the label was placed in the display above the ADJUSTMENT statement, as shown in the following illustration.


```
━  TekTMS/IPG - EDITTEST.PRG                         ▼ ▲
 File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options
 Translate                                                          F1=Help
PROCEDURE EDITTEST [ ]                                                  ▲
REMARK Locate R3 Gain Adj and preset it.
 PROMPT Set R3 Gain Adj to midrange.
 PROMPT PICTURE TEKPIC.BMP
REMARK Initialize instruments for tests to follow.
 SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT
 SETTING dmm acvthree acvrange
REMARK Adjust R3 Gain Adj to its nominal value.

 ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6
  MEASUREMENT dmm acvreading:calval
 END−ADJUSTMENT
 ADJUSTMENT calval LOW 5 NOMINAL 5.5 HIGH 6
  MEASUREMENT drnm acvreading:calval                                   ▼
```

2. To use the second way to add the label, perform the following:

   a. Select (highlight) the test step you wish to label.

   b. Choose **Edit** and **Add Label** from the menu.

   c. The label dialog box appears just as in 1b above. Continue on with Step 1c.

Adding a Comment to a Step

A comment added to a procedure step does not appear on the displayed outline. Comments appear only on the printed listing in `FULL` form. In this demonstration, we will add a comment to the `ADJUSTMENT` step in the original procedure.

To add the comment, perform the following:

1. Point and double-click the mouse on the procedure statement `ADJUST-MENT gaincal LOW 3 NOMINAL 3.6 HIGH 4.` The dialog box used to create the step appears.

2. Select **Comment.** When the **Comment** dialog box appears, enter *This is a comment.* in the edit box.

3. Select the **OK** pushbutton. When the **Adjustment** dialog box returns, select its pushbutton to add the comment and return to the procedure display. Notice that the comment does not appear in the display for the `ADJUSTMENT` statement.

Section 4
Menus

Menus

This section contains a complete reference of the IPG menus. It describes and illustrates each menu, menu item, and dialog box in IPG. The descriptions are arranged as follows:

> Menu Map
> Common Dialog Boxes
> Main Menu
> File Menu
> Edit Menu
> Actions Menu
> Operator Menu
> Links Menu
> Instruments Menu
> Run Menu
> Debug Menu
> Options Menu
> Translate Menu
> Help Menu
> Instrument Front Panel Menu
> Waveform Menu

Each menu description progresses completely through the menu items and dialog boxes for that menu before the next menu description begins.

You can access the Instrument Front Panel Menu by selecting **Instruments** from the Main Menu, and then selecting **View** from the menu list that appears. Highlight an instrument name and that front panel will be displayed.

A waveform display and the Waveform Menu appear when an instrument front panel view has the control type Waveform Display and you select its icon, or when you run a test procedure containing a waveform display step.

You can access the **Help** Menu by pressing the F1 keyboard key when you have a dialog box opened from the Actions or Operator Menus.

Menu Map

Following is a menu map of IPG. The menu bar is shown highlighted across the top of the map. The submenu items are listed vertically below the corresponding submenu titles.
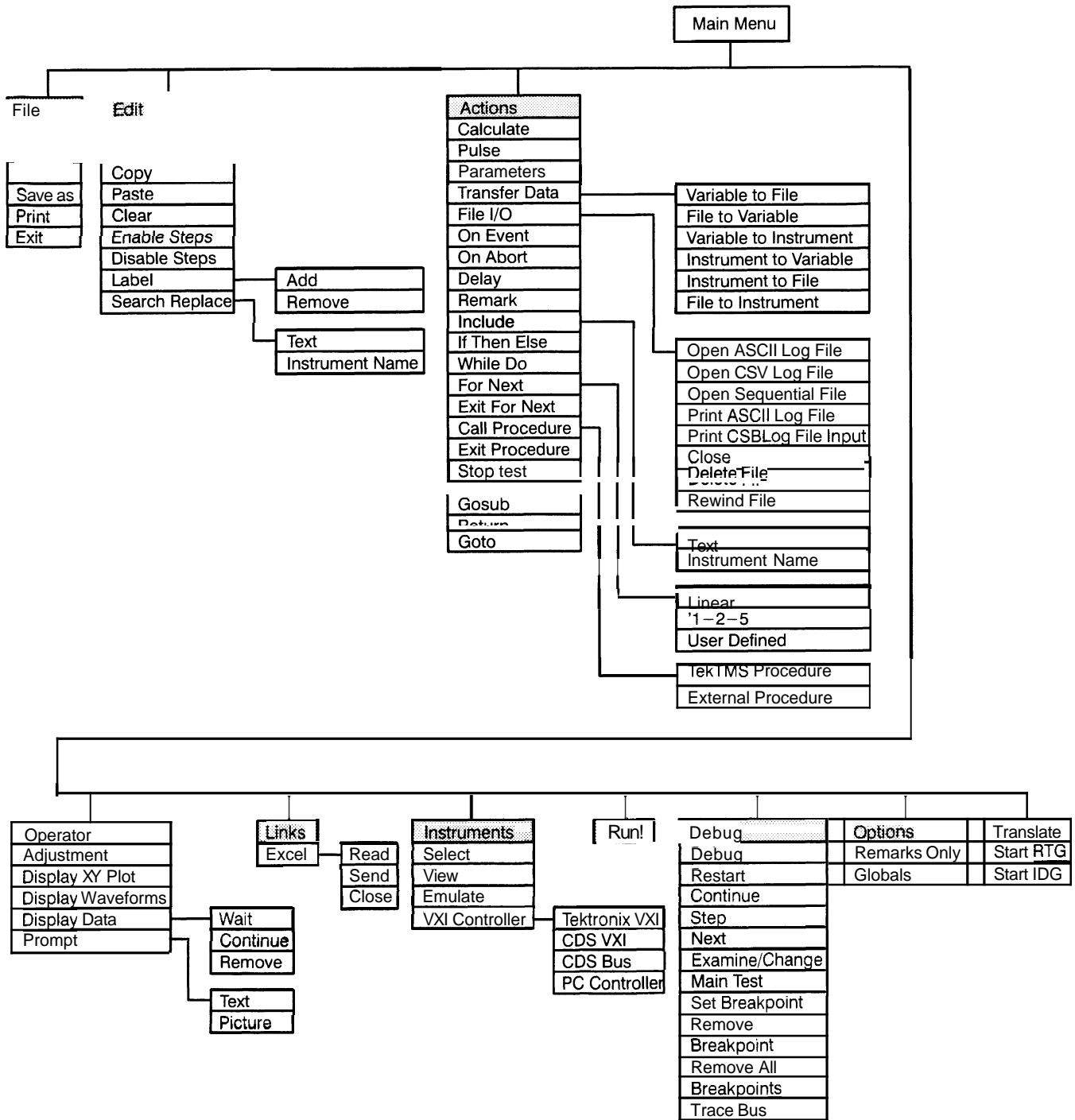
Common Dialog Box

IPG contains common **Label** and **Comment** dialog boxes that are accessed from more than one menu. These dialog boxes are described here and referenced where they appear in the menu descriptions.

Label Dialog Box

You can select the **Label** dialog box from any menu or dialog box where a **Label** menu item appears in the menu bar by pointing and clicking on the menu item with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. The **Label** dialog box allows you to add a label to a highlighted test procedure step.

```
┌──────────────────────────────────┐
│             LABEL                │
│ Edit                             │
│ ┌──────────────────────────────┐ │
│ │                              │ │
│ │ |                            │ │
│ │                              │ │
│ └──────────────────────────────┘ │
│   ┌──────────┐   ┌──────────┐    │
│   │   OK     │   │  Cancel  │    │
│   └──────────┘   └──────────┘    │
└──────────────────────────────────┘
```
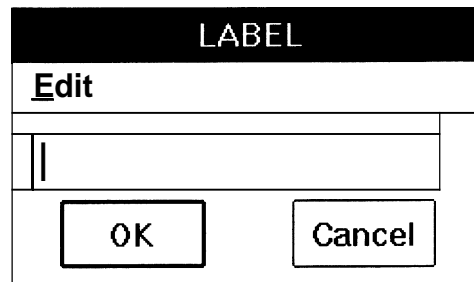
- **Edit** — You can select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box data. Refer to the *Edit Menu* description for further information on the menu and its use.

This dialog box contains an edit box for data and two pushbuttons:

- An untitled edit box where you enter up to 32 characters as a label for a highlighted test procedure step.

- **OK** — Select this pushbutton to complete the **Label** creation. **OK** lets this label be put in the test procedure step, but it does not have any interaction with the step you are labeling.

- **Cancel** — Select this pushbutton if you wish to cancel the **Label** dialog.

Comment Dialog Box

You can select the Comment dialog box from any menu or dialog box where Comment appears in the menu bar by pointing and clicking on the command with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. The Comment dialog box allows you to add a comment to a highlighted test procedure step.

Comments do not appear in the test procedure outline display. You can read comments on-screen only by double-clicking the mouse on a test procedure step that allows comments (such as an ADJUSTMENT step), then selecting Comment from the dialog box that will appear. You can also read comments in a **Full** printout of the test procedure. For further information on a **Full** printout, refer to the description of the Print command in the File Menu description.
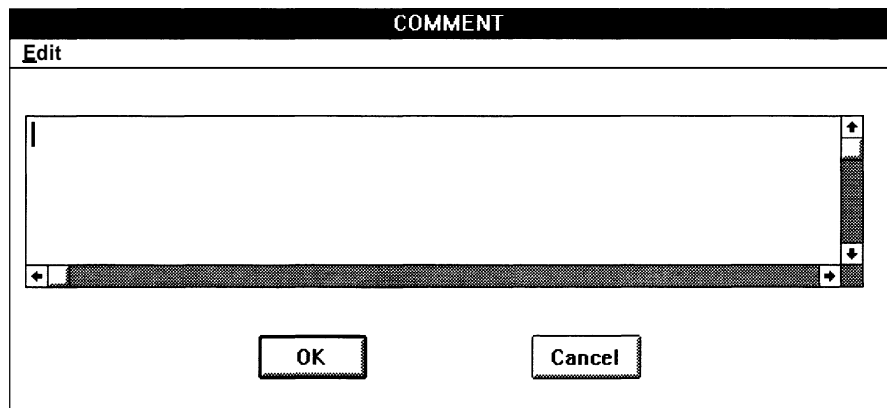
- Edit — You can select this command by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box data. Refer to the Edit Menu description for further information on the menu and its use.

This dialog box contains an edit box and two pushbuttons:

- An untitled edit box where you enter up to 32,000 characters as a comment for a highlighted test procedure step.

- **OK** — Select this pushbutton to complete the Comment creation. **OK** allows the comment to be put in the test procedure step, but it does not have any interaction with the step you are adding the comment to.

- Cancel — Select this pushbutton if you wish to cancel the Comment dialog.

Main Menu

The following Main Menu bar appears whenever you invoke IPG from Windows. It lists the available IPG menus. You can select any of these menus (except the Help Menu), by pointing and clicking with the mouse on the desired menu name, or by pressing and holding the ALT keyboard key while pressing the key corresponding to the underlined letter in the menu name. You can select the Help Menu by pressing the F1 keyboard key whenever you have a dialog box opened from the Operator or Actions Menus.)

```
┌─────────────────────────────────────────────────────────────┐
│ ▬           TekTMS/IPG - (untitled)                    ▼ ▲ │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                              F1=Help │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
│                                                               │
└─────────────────────────────────────────────────────────────┘
```
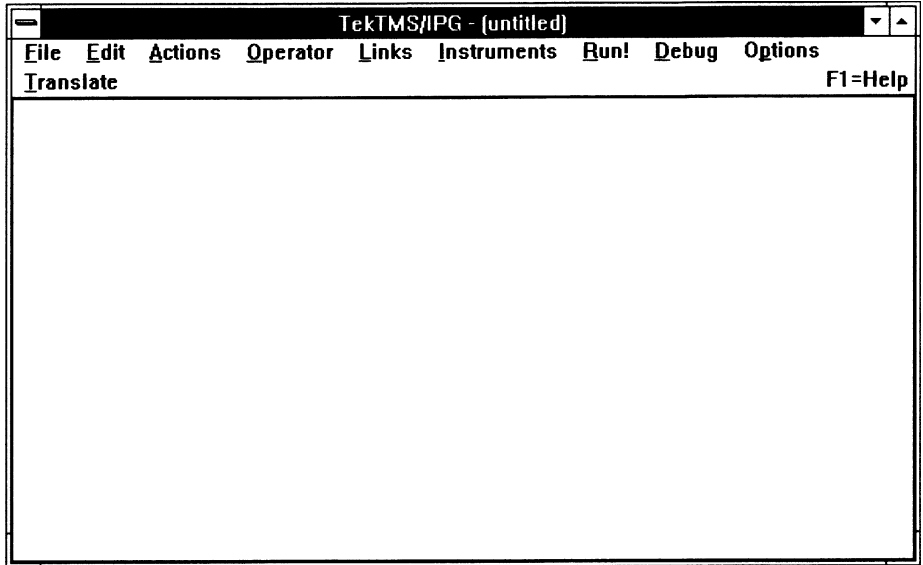
File Menu

The following File Menu appears whenever you select File from the Main Menu bar by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the F key. This menu gives you access to the file creation, loading, saving, and exiting facilities of IPG.

```
New
Open...
Save
Save as...
Print...
Exit
```
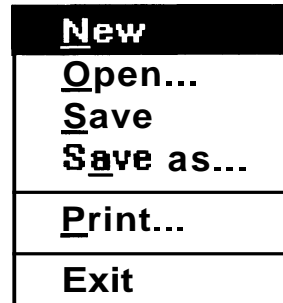
New

Select this menu item by pointing and clicking with the mouse, or by pressing the N keyboard key. **New** deletes all existing step data and instrument configuration data, removes the current file name from the title bar and replaces it with the message "TekTMS (untitled)", redisplays the Main Menu, and starts a new template for the test procedure file. If choosing New will destroy existing data, a message box will appear asking you to verify the requested action by selecting one of the following message box items:

- **Yes** — Select this pushbutton to save the currently displayed test procedure. If you select this pushbutton when the file has not been previously saved, IPG executes a Save **as...** so that you can name the file.

  No — Select this pushbutton to exit the current procedure without saving it (if the procedure had not previously been saved), or to abandon the current editing session (if it was a previously saved procedure)

- Cancel — Select this pushbutton to cancel the action and return to the currently displayed procedure.

Open

Select this menu item by pointing and clicking with the mouse, or by pressing the O keyboard key. **Qpen...** allows you to load a different test procedure file. If you already have a file loaded, and you have changed that file, when you select **Open...** a message box will appear asking you whether you wish to save the file that is currently loaded.

If there is no Edit or Run password associated with the file that you have selected to be opened, the following dialog box will appear (after a currently loaded file, if any, has been saved or abandoned). If the file was originally saved with an Edit or Run password, you will be prompted for the password before **Qpen...** loads the file. If you enter an Edit password, you will be able to either Edit O Run the file. If you enter a Run password, you will be able to Run the file, but you will not be able to Edit it. For more information about the Edit and Run passwords, refer to the following Save as... description.
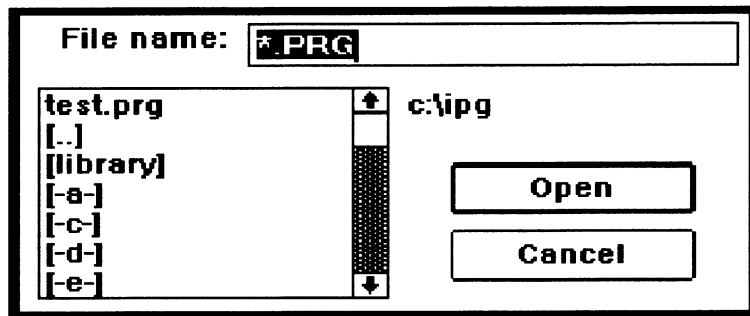
IPG provides the following dialog box items for user interaction:

- A current directory pathname beside a list box containing file names you can select, or disk drives and directories you can select to display other file names.

- **File Name:** — An edit box where you either keyboard enter the file name desired, or where the file name will appear if you point and click with the mouse on a file name listed in the previously described list box.

- **Open** — Select this pushbutton to complete the **Qpen...** action.

- **Cancel** — Select this pushbutton if you wish to cancel the **Open....**

Save

Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. **Save** saves the displayed test procedure in the current file. If the file is untitled, a **Save As** dialog box will appear for user interaction.

Save as

Select this menu item by pointing and clicking with the mouse, or by pressing the A keyboard key. **Save as...** opens the following dialog box, allowing you to save a test procedure file that has not been previously saved, save another file version of the current test procedure file (make a copy of the file under a different name), and add or change an EDIT or RUN password for a previously saved file.
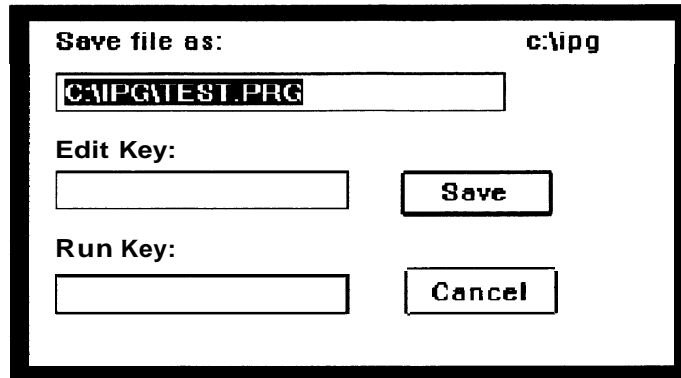
IPG provides the following dialog box items for user interaction:

- **Save File as:** — An edit box where you enter the file named under which you want the current test procedure to be saved. If the current procedure was previously saved, its previous name appears here.

- The current directory pathname (in the upper right hand corner of the dialog box).

- **Edit Key:** — An edit box where you enter an Edit password for a specified file. After you have entered this password, a user will be prompted to enter that password any time the file is selected to be opened. If the file has both Edit and Run passwords, entering the Edit password will suffice for both functions.

- **Run Key:** — An edit box where you enter a Run password for a specified file. After you have entered this password, a user will be prompted to enter that password any time the file is selected to be opened. Entering the Run password will allow the user to Run the file, but not to Edit it.

- **Save** — Select this pushbutton to complete the **Save as...** action.

- **Cancel** — Select this pushbutton if you wish to cancel the **Save as....**

Print

Select this menu item by pointing and clicking with the mouse, or by pressing the P keyboard key. **Print...** opens the following dialog box, allowing you to select the part of a test procedure you want to print, then sending that test procedure to the printer configured for use by Windows.

```
┌─────────────────────────────────┐
│  ┌─Print──────────┐  ┌─────────┐ │
│  │ ○ Outline      │  │   OK    │ │
│  │                │  └─────────┘ │
│  │ ○ Full         │  ┌─────────┐ │
│  └────────────────┘  │ Cancel  │ │
│  ☐ Print to file     └─────────┘ │
│  File:                           │
│  ┌─────────────────────────────┐ │
│  └─────────────────────────────┘ │
└─────────────────────────────────┘
```
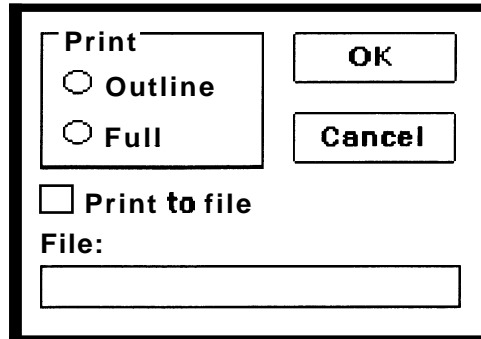
IPG provides the following dialog box items for user interaction:

- **Print** — The group name for the **Outline** and **Full** radiobuttons.

    - **Outline** — Selecting this radiobutton prints the test procedure as it appears on the screen. The screen displays up to **75** characters per test step, with various rules of truncation. For example, if the display is pure text, the screen replaces the last three characters (of the **75)** with an ellipsis (. . .). If the display is an expression, the screen always prints the variable name and the equal symbol (=), then those complete terms or operators up to 72 characters, followed by an ellipsis (. . .). The screen display does not print comments.

    - **Full** — Selecting this radiobutton prints the entire test procedure outline as generated by IPG, including full Remarks, Comments, and step lines.

- **Print to File** — Selecting this check box allows the test procedure to be printed into an ASCII format file.

- **File:** — An edit box where you enter the path name for the file you want to print to (when using **Print to File).** The edit box automatically scrolls horizontally and accepts up to 128 characters.

- **OK** — Select this pushbutton to complete the **Print...** action.

    Cancel — Select this pushbutton if you wish to cancel the **Print...**

Exit

Select this menu item by pointing and clicking with the mouse, or by pressing the X keyboard key. **Exit** ends the current test procedure generation session and closes the IPG window. If the window contains a test procedure that was changed since the last **Save,** a message box will appear asking you to verify whether the procedure should be saved or abandoned. The message box contains the following choices:

- **Yes** — Select this pushbutton to save the currently displayed test procedure. If you select this pushbutton when the file has not been previously saved, IPG executes a **Save as....**

- **No** — Select this pushbutton to exit IPG without saving the current procedure (if the procedure had not previously been saved).

- **Cancel** — Select this pushbutton to abort the **Exit** action and return to the currently displayed procedure.

Edit Menu

The Edit Menu items appear whenever you point and click the mouse on the **Edit** menu item from the Menu Bar of the Main Menu or from a dialog box. The Edit Menu also will appear if you press and hold the ALT keyboard key while pressing the E keyboard key when you are currently in the Main Menu, or in a dialog box containing the **Edit** command. When you select the Edit Menu, you gain access to the edit functions of IPG.

The menu items in the Edit Menu are shown in black when enabled or shown in gray when disabled, reflecting the capability of IPG to perform a specific edit function. The menu items may display differently for a dialog box than for a procedure outline. For example, when IPG displays a dialog box, the **Paste** item is shown in gray if nothing is stored on the clipboard. The **Cut, Copy,** and **Clear** items are enabled (shown in black) only when you have selected a step. Also, IPG may not display a **Clear** item in the Edit Menu for a dialog box.

The Edit Menu items perform their actions on whatever test procedure steps are highlighted. To highlight a single step, point and click the mouse on that step. To highlight multiple contiguous steps, press and hold the SHIFT keyboard key while pointing and clicking the mouse on the first and last steps of the contiguous group that you want to highlight. To highlight multiple noncontiguous steps, press and hold the CTRL keyboard key while pointing and clicking the mouse on each step you want to highlight.

Undo	Alt+BkSp
Cut	Shift+Del
Copy	Ctrl+Ins
Paste	Shift+Ins
Clear	Del
Enable Steps	
Disable Steps	
Label	▶
Search/Replace	▶

Undo

Select this menu item by pointing and clicking with the mouse, or by pressing the U keyboard key. **Undo** reverses the edit action of the most recent Edit Menu selection. If you repeatedly select **Undo,** IPG switches between the current edit state and the previous edit state. (For example, if you have inserted a word, the first **Undo** removes it, while the second **Undo** replaces it.) **Undo** is enabled only when a reversible edit action exists.

Cut

Select this menu item by pointing and clicking with the mouse, or by pressing the T keyboard key. **Cut** copies highlighted text to the clipboard, and deletes it from the procedure. When you highlight a single action statement of a multiple statement test procedure action (such as one of the IF,THEN, or ELSE statements from an IF-THEN-ELSE construct), **Cut** copies all the action statements of the construct to the clipboard, then deletes the statements from the procedure. However, text added between the action statements is neither copied nor deleted. If you wish to delete the text, you must highlight and delete it separately.

<u>C</u>opy

Select this menu item by pointing and clicking with the mouse, or by pressing the C keyboard key. **Copy** copies highlighted text to the clipboard without deleting it from the procedure. When you highlight a single statement of a multiple statement test procedure action (such as one of the IF, THEN,or ELSE statements from an IF-THEN-ELSE construct), **Copy** copies all action statements of the construct to the clipboard. However, text added between the action lines is not copied. If you wish to copy the text between the action lines, you must highlight and copy it separately.

<u>P</u>aste

Select this menu item by pointing and clicking with the mouse, or by pressing the P keyboard key. **Paste** copies the contents of the clipboard to the test procedure ahead of the currently highlighted line.

Clear

Select this menu item by pointing and clicking with the mouse, or by pressing the I keyboard key. **Clear** deletes a highlighted item, but does change the contents of the clipboard.

<u>E</u>nable Steps

Select this menu item by pointing and clicking with the mouse, or by pressing the E keyboard key. **Enable Steps** reverses the action of the following **<u>D</u>isable Steps** item.

<u>D</u>isable Steps

Select this menu item by pointing and clicking with the mouse, or by pressing the D keyboard key. **Disable Steps** allows you to leave a step in a procedure, but to disable it so that the procedure will not act upon it when run.

*If you use the **Enable Selected Steps** or **Disable Selected Steps** items on a portion of a control structure (such as an IF-THEN-ELSE, or a WHILE-DO), all portions of the control structure are affected (such as the* END *I* F *statement). However; any steps that have been added within that structure will not be affected. For example, if your procedure contains a disabled IF-THEN-ELSE structure with* CALCULATE *steps between the* I F *and* THEN *statements and between the* THEN *and* ELSE *statements of the control structure, the* CALCULATE *Steps will remain enabled (unless you disable them separately. Also, you cannot use the **Disable Selected Steps** item on either the* PROCEDURE *or* END-PROCEDURE *statements in a test procedure.*

Label

*The **Label** menu item lets you **Add** a label to the selected test step or **R e move** a label from the selected test step. Label is used with the* GOTO *and* GOSUB *test steps. A labeled step that is referenced by a* GOTO *or* GOSUB *step, will be the next step to execute when a* GOTO *or* GOSUB *step is executed.*
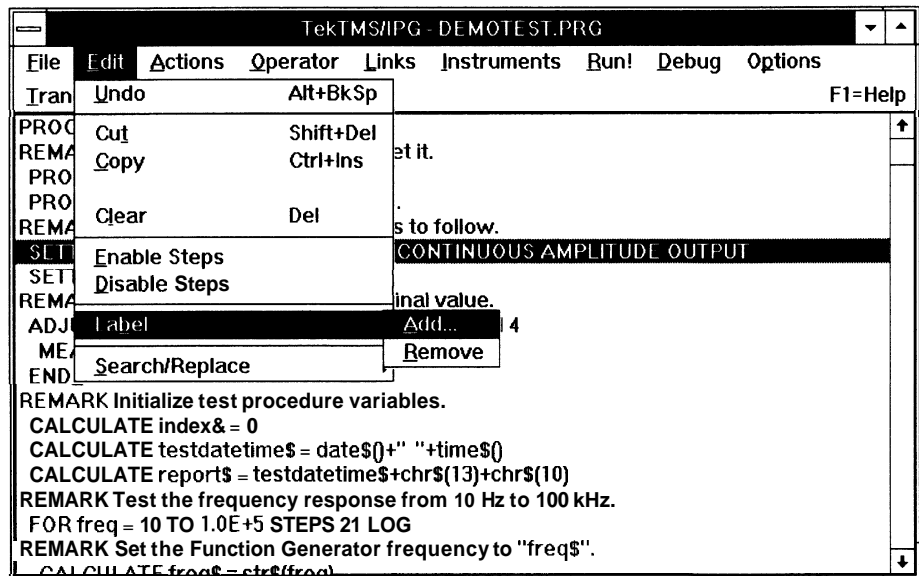
Label provides the following choices:

- **Add...** — Selecting **Add** will bring up the **Label** dialog, as shown below, and let you assign a label to the selected test step. Most steps have a label menu item in the step dialog. The **Label Add** menu item uses the same dialog as the test step dialog Label menu item. If the step already has a label, that label is displayed in the **Label** dialog edit box and can be modified.

  After entering a label, select **OK** to assign it to the selected test step. If the text you entered is not a valid label or is not unique, an error message is displayed and the label is not accepted. If the label is valid, the **Label** dialog closes. Select **Cancel** to discard any entry and exit the **Label** dialog.

```
┌──────────────────────────────────────┐
│                LABEL                   │
├──────────────────────────────────────┤
│ Edit                                   │
│  ┌──────────────────────────────────┐ │
│  │                                  │ │
│  │ |                                │ │
│  │                                  │ │
│  └──────────────────────────────────┘ │
│   ┌──────────┐      ┌──────────┐       │
│   │   OK     │      │  Cancel  │       │
│   └──────────┘      └──────────┘       │
└──────────────────────────────────────┘
```
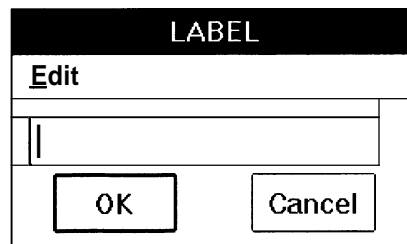
- **Remove** — This menu item removes a label from the selected test step. If the selected step does not have a label, then there is no change to the step.

Search/Replace

Search and Replace scan the current test procedure steps for a given text string or instrument name. When searching for a string you may either replace it, change it, or search for the next occurrence of the string. When searching for an instrument name you may either replace all occurrences or search for the next step with a matching instrument name. The replace option will check the resulting string for errors before completing a text replacement. Search checks for any occurrence of the search string in a user defined string in a test procedure step. Search/Replace provides **Text** and **Instrument Name** choices:

Text — The Text option lets you search through test procedure steps for a specific text string. Only the user entered text is scanned in each test step. Keywords such as Calculate, Remark, For, While, etc., are not part of the text search. User defined variable names, string constants, global variables, and other user specified strings are scanned for a match. When a match is found, the step dialog for the step type where the string was found is selected and the found string is highlighted. Searching for a string is similar to editing (double clicking) a test step in the outline view of the test procedure and having the search text highlighted.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ─            TekTMS/IPG - DEMOTEST.PRG                          ▼ ▲        │
├───────────────────────────────────────────────────────────────────────── │
│ File │ Edit │ Actions  Operator  Links  Instruments  Run!  Debug  Options  Translate │
│      ┌───────────────────────┐                                    F1=Help │
│ PROC │ Undo          Alt+BkSp │                                         ✦  │
│ REMA │ Cut           Shift+Del│ t it.                                      │
│ PRO  │ Copy          Ctrl+Ins │                                           │
│ PRO  │ Paste         Shift+Ins│ to follow.                                 │
│ REMA │ Clear         Del      │ CONTINUOUS AMPLITUDE OUTPUT                │
│ SET  ├───────────────────────┤                                           │
│ SET  │ Enable Steps           │ nal value.                                 │
│ REMA │ Disable Steps          │ L 3.6 HIGH 4                               │
│ ADJU ├───────────────────────┤                                           │
│  ME  │ Label               ▶  ├──────────────────────┐                    │
│ END  ├───────────────────────┤  Text...             │                    │
│      │ Search/Replace         │  Instrument Name...  │                    │
│ REMARK Initialize test procedure vari└─────────────────┘                  │
│  CALCULATE index& = 0                                                      │
│  CALCULATE testdatetime$ = date$()+" "+time$()                             │
│  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)                       │
│ REMARK Test the frequency response from 10 Hz to 100 kHz.                  │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                                      │
│ REMARK Set the Function Generator frequency to "freq$".                    │
│   CALCULATE freq$ = str$(freq)                                             │
│   SETTING fg FREQUENCY:freq$                                               │
│ REMARK Delay for DMM range change.                                     ✦  │
└─────────────────────────────────────────────────────────────────────────┘
```

When searching for text, the following dialog is displayed. This dialog gives
you several options. You may specify the text to search and the text to
replace. You may select matching on upper and lower case letters in
searches. You may also select verify for Replace All. The **Search/Replace**
dialog will remain on screen until you close it using the system menu Close
option, select New from the TekTMS/IPG File menu, or close TekTMS/IPG.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ─                        SEARCH / REPLACE                                 │
├───────────────────────────────────────────────────────────────────────── │
│  Search For:    │R3                                                    │   │
│                                                                           │
│  Replace With:  │R6|                                                   │   │
│                                                                           │
│  ☐ Match case   ☐ Verify   │ Find next │  │ Replace │  │ Replace All... │ │
└─────────────────────────────────────────────────────────────────────────┘
```
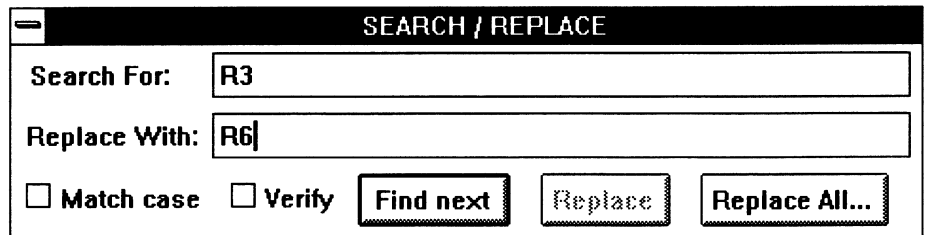
The **Search/Replace** text menu items are as follows:

■   Search For edit box is used for entry of the search string. This text
    string can contain any printable ASCII characters.

■   Replace With edit box is used for entry of the replacement string. This
    text string can contain any printable ASCII characters. Care should be
    taken when specifying a replacement string. All the new strings created
    with the replacement string will be checked for proper syntax for each
    step type being modified. This edit box is disabled until you have en-
    tered text into the Search For edit box.

■   Match Case option will force the search to match the character case of
    the search string. All characters must match in upper and lower case if
    this option is used. This option is disabled until you enter text in the
    Search For edit box.

■ **Verify** allows you to accept or reject a modified text string before completing the text replacement during Replace All. This choice is disabled until you enter text into the **Replace With** edit box.

■ **Find next** searches for the text string specified in the **Search For** edit box, starting at the currently selected test step. If a string was last found in the current test step then the search starts at the character following where the last string was found or just after its replacement string.

In the following example, the string R3 is entered into the **Search For** edit box and the **Find next** button is pressed. The test procedure is searched, starting at the beginning of the procedure. The first occurrence of the string R3 is found in the text of a Remark step. When the string is found, the **Remark** step dialog becomes active and the found text is highlighted.

To continue searching for the next occurrence of R3 you must close the **Remark** step dialog. The **Find next** button is disabled while the step dialog is active. Once you have found a string, you may modify it and save the change or cancel and end the step dialog.
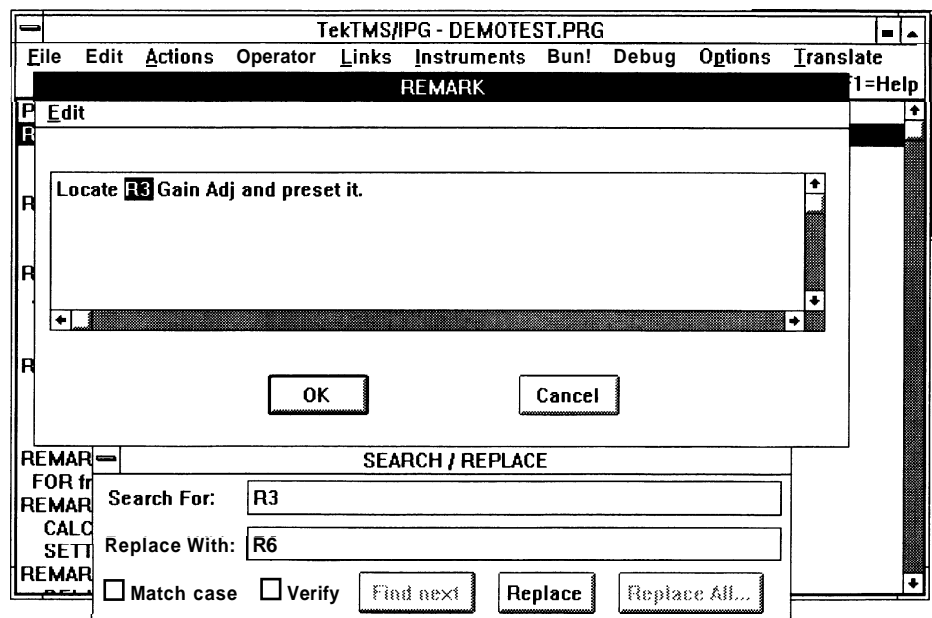
■ **Replace** lets you replace the selected text with the **Replace With** text. The **Replace** button is enabled when a text string is found.

■ **Replace** All will bring up the following dialog box. This dialog allows you the option of changing all the matching text in the test program, or limiting the number of replacements.
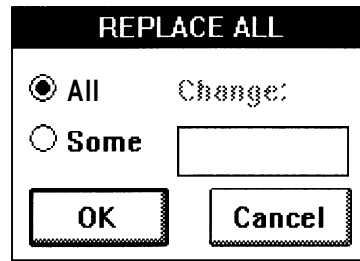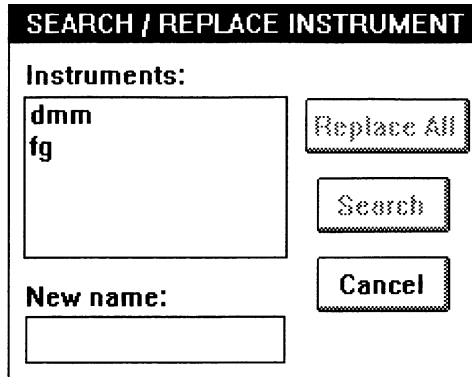
The **Replace All** dialog selections are as follows:

- **All** is the default option. If you push the **OK** button now, all user entered text in the test procedure that matches the **Search For** string will be replaced with the **Replace With** string.

- **Some** lets you choose the number of replacements you wish done. When **Some** is chosen, the **Change** edit box is enabled and you can enter the number of replacements.

- **Change:** box is where you enter the number of replacements to make when the **Replace All** button is pressed.

- **OK** closes the dialog box and the requested **Replace All** actions are performed. The **Replace All** button in the **Search/Replace** dialog is change to read **Cancel Change.** If the **Cancel Change** button is pressed, the current **Replace All** operation is terminated. When the Replace All is complete, a message box displays the number of replacements made.

- **Cancel** exits the **Replace All** request without doing a search and replace. The **Replace All** dialog is closed.

Instrument Name — You may search instrument steps for a selected instrument name. Only the Setting, Measurement, and Transfer Data steps using an instrument are searched.
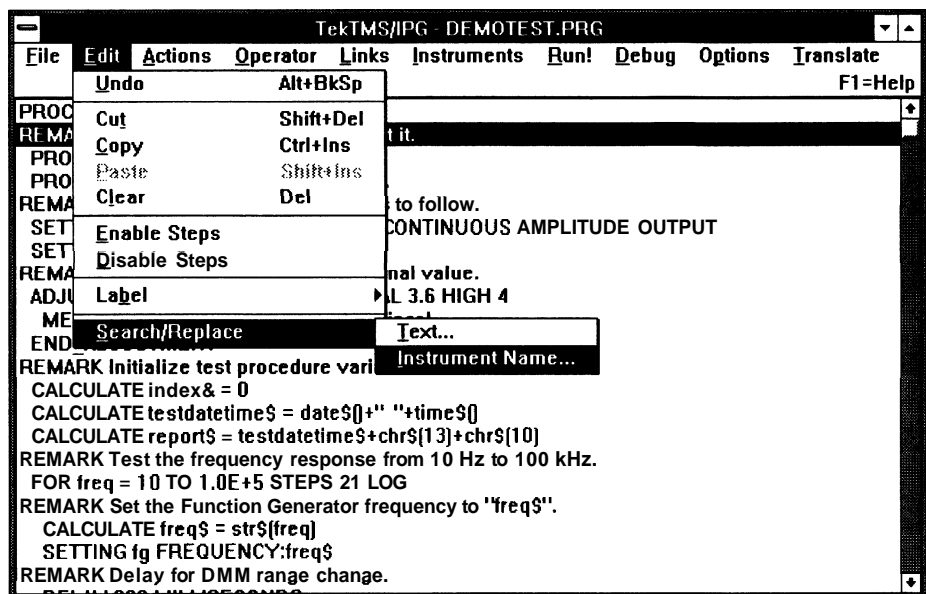
When you select **Search/Replace Instrument Name** from the menu the following dialog box appears. This dialog contains a list of the instruments selected for this test procedure. You may select one of these instruments and either search for the next instance of the name, or you may replace all instances of the name in the test procedure. This **Replace All** function is useful if you are replacing one instrument with another one that is functionally equivalent.

```
┌──────────────────────────────────────────┐
│ SEARCH / REPLACE INSTRUMENT              │
│                                           │
│ Instruments:                              │
│ ┌────────────────┐   ┌───────────────┐   │
│ │ dmm            │   │  Replace All  │   │
│ │ fg             │   └───────────────┘   │
│ │                │   ┌───────────────┐   │
│ │                │   │    Search     │   │
│ │                │   └───────────────┘   │
│ └────────────────┘   ┌───────────────┐   │
│ New name:            │    Cancel     │   │
│ ┌────────────────┐   └───────────────┘   │
│ │                │                        │
│ └────────────────┘                        │
└──────────────────────────────────────────┘
```

Instruments

This list box shows the instruments selected for the current test procedure. When you select one of the listed instruments the selected instrument name is placed in the **New name** edit box and the **Replace All** and **Search** buttons are enabled.

■   **New name:** edit box contains the new name for the selected instrument if a **Replace All** operation is requested. This name must be a unique valid instrument name or you will get an error message and the **Replace All** operation will stop.

■   **Replace All** causes all instrument names, in test steps, that match the selected instrument name to be replaced with the instrument name in the **New name** edit box. The name in the **New name** edit box must be a unique valid instrument name or you will get an error message and the **Replace All** operation will stop. The **Search/Replace Instrument Name** dialog is closed when the replacement of instrument names completes. The instrument name in the Instrument Selection and Instrument View is also changed by **Replace All.**

■   **Search** selects the next step containing an instrument name matching the name selected in the **Instruments** list box. The **Search/Replace Instrument Name** dialog is closed when the search completes.

■   **Cancel** closes the **Search/Replace Instrument Name** dialog

Actions Menu

The Actions Menu items appear whenever you select **Actions** from the Main Menu, or when you press and hold the ALT keyboard key while pressing the A key while in the Main Menu. **Actions** allows the user to create action-type test procedure steps, which are self-defined by the items in the Actions menu.

Calculate...	**If Then Else...**
Dimension...	**While Do...**
Pulse Parameters...	**For Next** ▶
Transfer Data ▶	**Exit For Next...**
File I/O ▶	**Call procedure** ▶
On Event...	**Exit Procedure...**
On Abort...	**Stop Test...**
Delay...	**Gosub...**
Remark...	**Return...**
Include ▶	**Goto...**

Calculate

Select this menu item by pointing and clicking with the mouse, or by pressing the C keyboard key. **Calculate...** opens the following dialog box, allowing you to define an expression to be calculated, and to specify the variable name where you wish the resultant calculation to be stored.

```
                        CALCULATE
 Edit   Label   Comment

 Verisble:                      Expression:
 [I                        ]  =  [                        ]

              [   OK   ]         [  Cancel  ]
```

NOTE

If you press *F1* while the **Calculate** dialog box is open, a Help message will appear that lists the functions that are available in IPG, as well as the types of expressions allowed. Functions and Expressions are also defined in Section 2, Getting Started.

■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **label** allows you to add labels to a test procedure step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to a test procedure step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **Variable:** — An edit box where you enter the test procedure variable name where you wish the calculation result to be stored. The variable data type that you enter must match the data type of the expression, or an error message will appear listing the available Data Type Suffixes. (Data Type Suffixes are also defined in Section 2, Getting Started.) This edit box horizontally scrolls up to 255 characters.

■ **Expression:** — An edit box where you enter the expression to be calculated. This edit box horizontally scrolls up to 255 characters.

■ **OK** — Select this pushbutton to complete the **Calculate...** creation.

■ **Cancel** — You can select this pushbutton to cancel the **Calculate....**

Dimension

Select this menu item by pointing and clicking with the mouse, or by pressing the E keyboard key. **Dimension...** opens the following dialog box, allowing you to define an array for storing data. A subscripted reference is used to designate the array elements. The value of the subscript can be from 0 to the number in the DIMENSION step. If the subscript is a floating point number, it is truncated before being used as a subscript. For example:

```
DIMENSION TestValue[20]

CALCULATE TestValue[0] = 1.23
CALCULATE TestValue[4.3] = 100.2
CALCULATE TestValue[i] = 10.0
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to a test procedure step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to a test procedure step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Array:** — An edit box where you enter the array variable name and its size in the form *variable_name[size]*. size is limited only by the amount of available memory.

- **OK** — Select this pushbutton to complete the **Dimension...** creation.

  Cancel — Select this pushbutton to cancel the **Dimension....**

Pulse Parameters

Select this menu item by pointing and clicking with the mouse, or by pressing the L keyboard key. **Pulse Parameters...** opens the following dialog box, allowing you to select a stored waveform, perform a selected pulse parameter analysis function on it, and store the result in a variable.

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to a test procedure step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to a test procedure step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction.

■ **Input Waveform Variable:** — An edit box where you enter the variable name of the waveform to be analyzed. This variable name must be the same as the variable name that was assigned to the Instrument Front Panel measurement control in the test procedure step that acquired the waveform, or a variable with an ADIF 1.00 waveform file assigned (using the **File to Variable...** menu item of the Transfer Data Menu) to it.

■ **Pulse Parameter/Program Variable:** — This list box provides a listing of all available pulse parameter analysis functions with their user-assigned **Program Variable:** names. These assigned variable names appear in the list as they are assigned. If you need definitions for the listed functions, refer to the *ANSI/IEEE* Std *181-1977, IEEE* Standard on Pulse Measurement and Analysis by Objective Techniques.

■ **Program Variable:** — An edit box where you enter the variable name to be assigned to the result of the analysis performed by the selected pulse parameter function. To assign the variable name to the Pulse Parameter function result, highlight the Pulse Parameter function name, enter the variable in this edit box, and select the **Add** pushbutton.

■ **Add** — Select this pushbutton to complete the assignment of a **Program Variable:** to a highlighted Pulse Parameter. After you select **Add,** the variable name appears in the **Program Variable** list.

■ **Delete** — Select this pushbutton to delete a currently assigned **Program Variable:** for a highlighted Pulse Parameter.

■ **Change** — Select this pushbutton to complete a change made to a previously established **Program Variable:.** To change a Program Variable, highlight it (the variable name will appear in the **Program Variable:** edit box) edit it with the keyboard, then select **Change.**

- **Base/Top Method** — The group name for the **Histogram** and **Min-Max** radiobuttons. When IPG analyzes an acquired waveform, the method used to establish the value of the Top and Base is determined by which of these buttons has been selected. The following definitions for **Histogram** and **Min-Max** explain the two methods.

  - **Histogram** — This radiobutton selects a distribution-density method of establishing a single point value for each waveform point. This method sets each waveform point to the value where the sample values occurred most frequently. In this method, the waveform's lowest point value is the **Base,** and its highest point value is the **Top.**

  - **Min-Max** — This radiobutton selects a method where two values (Minimum and Maximum) are established for each waveform point. A minimum and maximum are established from the first set of sample points, then each subsequent set of sample points is evaluated to establish the minimum and maximum value for that set. These values are used to update the previously established minimum and maximum. This sequence continues until the entire waveform has been evaluated, at which time the minimum value becomes the **Base** and the maximum value becomes the **Top.**

- **Set Crossing** — **A** pushbutton that opens the following dialog box, allowing you to select the crossing levels, starting cycle, and leading edge (positive or negative) on a waveform that is to be analyzed.

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Crossing Levels** — The group name for the **Percent of Base/Top** and **Absolute Amplitude** radiobuttons, and the associated **Distal, Mesial,** and **Proximal** edit boxes. The radiobuttons select how crossing levels are established and the edit boxes allow you to set the crossing level values.

  - **Percent of Base/Top** — This radiobutton selects a crossing level mode establishing crossing levels as a percentage of the waveforms **Top** and **Base** values.

  - **Absolute Amplitude** — This radiobutton selects a crossing level mode establishing crossing levels as absolute values.

  - **Distal** — An edit box where you enter the Distal crossing location as a percentage of **Top** and **Base** values (for **Percent of Base/Top** mode) or the absolute value (for **Absolute Amplitude** mode).

  - **Mesial** — An edit box where you enter the Mesial crossing location as a percentage of **Top** and **Base** values (for **Percent of Base/Top** mode) or the absolute value (for **Absolute Amplitude** mode).

  - **Proximal** — An edit box where you enter the Proximal crossing location as a percentage of **Top** and **Base** values (for **Percent of Base/Top** mode) or the absolute value (for **Absolute Amplitude** mode).

- **Starting Cycle:** — An edit box where you enter an integer specifying which waveform cycle you want the pulse analysis to start on (for example, enter 1 for the first cycle, 2 for the second cycle, etc.).

- **Leading Edge** — The group name for the **Positive** and **Negative** radiobuttons. These radiobuttons select the whether the start of the pulse analysis will be on the positive-going or negative-going edge of the waveform.

- **OK** — Select this pushbutton to complete the **Set Crossing** creation.

  Cancel — Select this pushbutton to cancel the **Set Crossing.**

- **OK** — Select this pushbutton to complete the **Pulse Parameters...** creation.

- **Cancel** — Select this pushbutton to cancel the **Pulse Parameters....**

Transfer Data

Select this menu item by pointing and clicking with the mouse, or by pressing the T keyboard key. **Transfer Data...** opens the following menu list, allowing you to select a source and destination for data transfers.

```
Variable to File...
File to Variable...
Variable to Instrument...
Instrument to Variable...
Instrument to File...
File to Instrument...
```
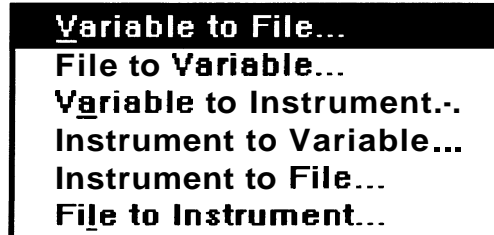
- ■ **Variable to File...** — Select this menu item by pointing and clicking with the mouse, or by pressing the V keyboard key. **Variable to File...** opens the following dialog box, allowing you to select the desired source and destination of a transfer. (If you enter *LPT1.* for the **File Name:,** the contents of the variable are sent to the printer.)

```
           TRANSFER VARIABLE TO FILE
  Edit    Label   Comment

  File Name:              Variable:
  [*.DAT]                 [                      ]

  c:\ipg

  [..]            ↑
  [library]                 [   OK   ]    [ Cancel ]
  [-a-]
  [-c-]
  [-d-]
  [-e-]           ↓
```

- ■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

- ■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- ■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

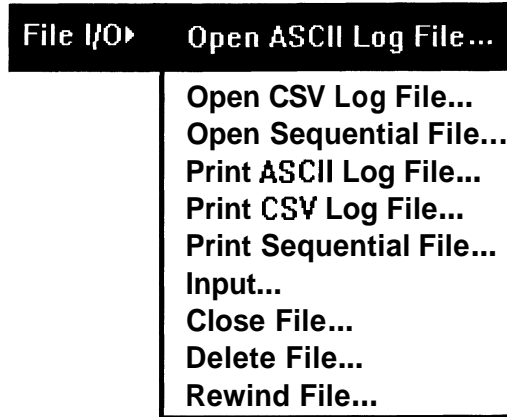IPG provides the following dialog box items for user interaction:

- File Name: — An edit box where enter the file name.

- Variable: — An edit box where you enter the variable name.

- A disk drive/directory list box (identified with a directory path above the box) containing file names that you can select as the destination, or disk drives and/or directories where other file names can be found for selection.

- OK — Select this pushbutton to complete the Variable **to** File**...** creation.

- Cancel — Select this pushbutton to cancel the Variable **to** File**....**

NOTE

The format of data files associated with data transfers to and from files follows rules similar to BASIC language READS and WRITES.

On transfers to (WRITE) or from (READ) a file, the file stays open. Under this condition any transfer to a file (WRITE) *is* appended to the end of the file, and any transfer from a file (READ) *starts* at the next character following the end of the previously read data.

The system cannot reposition a file when transferring data to and from it. In other words, you cannot transfer to a file and then transfer the same data from the file to a test, since there is no way to rewind the file. Once a file is opened, it remains open until test execution stops.

- File **to** Variable**...** — Select this menu item by pointing and clicking with the mouse, or by pressing the F keyboard key. **File to** Variable**...** opens the following dialog box, allowing you to select the desired source and destination for a transfer.

```
┌─────────────────────────────────────────────────────┐
│           TRANSFER FILE TO VARIABLE                   │
│  Edit   Label   Comment                               │
│                                                       │
│  File Name:              Variable:                    │
│  ┌──────────────────┐    ┌──────────────────────────┐ │
│  │ *.DAT            │    │                          │ │
│  └──────────────────┘    └──────────────────────────┘ │
│  c:\ipg                                               │
│  ┌────────────────┬─┐                                 │
│  │ [..]           │▲│    ┌──────────┐   ┌──────────┐  │
│  │ [library]      │ │    │    OK    │   │  Cancel  │  │
│  │ [-a-]          │ │    └──────────┘   └──────────┘  │
│  │ [-c-]          │▓│                                 │
│  │ [-d-]          │▓│                                 │
│  │ [-e-]          │▼│                                 │
│  └────────────────┴─┘                                 │
└─────────────────────────────────────────────────────┘
```

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **File Name:** — An edit box where you enter the file name. (This should be an ASCII text file.)

Variable: — An edit box where you enter the variable name. If **Variable:** is a string, the text from the file specified in **File Name:** (from the current location in the file to the next CRLF) is placed into the string variable, and the current location in the file is updated. If **Variable:** is a number, a string of characters up to a CRLF is read into the variable and an attempt is made to convert them into a number. (The type of conversion depends on the type of number specified, either integer or floating point.)

A disk drive/directory list box (identified with a directory path above the box) containing file names that you can select as the source, or disk drives and/or directories where other file names can be found for selection.

OK — Select this pushbutton to complete the **File to Variable...** creation.

■ **Cancel** — Select this pushbutton to cancel the **File to Variable....**

NOTE

The format of data files associated with data transfers to and from files follows rules similar to BASIC language READS and WRITES

On transfers to (WRITE) or from (READ) a file, the file stays open. Under this condition any transfer to a file (WRITE) is appended to the end of the file, and any transfer from a file (READ) starts at the next character following the end of the previously read data.

The system cannot reposition a file when transferring data to and from it, In other words, you cannot transfer to a file and then transfer the same data from the file to a test, since there is no way to rewind the file. Once a file is opened, it remains open until test execution stops.

- ■ **Variable to Instrument...** — Select this menu item by pointing and clicking with the mouse, or by pressing the A keyboard key. **Variable to Instrument...** opens the following dialog box, allowing you to select the desired source and destination for a transfer.

TRANSFER VARIABLE TO INSTRUMENT			
Edit Label Comment			
TMS Name	**Driver**	**Port**	**Address**
Variable:		**OK**	**Cancel**

- ■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- ■ **label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- ■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- A list box from which you select the instrument you want for the destination (by pointing and clicking with the mouse). The list shows all the instruments currently loaded into IPG.

  Variable: — An edit box where you enter the variable name. If the variable type is numeric, it is converted into a string and then sent to the instrument without any modification (other than what is required for the particular bus communication protocol).

- **OK** — Select this pushbutton to complete the Variable to Instrument**...** creation.

- Cancel — Select this pushbutton to cancel the Variable to Instrument**....**

Instrument to Variable — Select this menu item by pointing and clicking with the mouse, or by pressing the I keyboard key. Instrument to Variable**...** opens the following dialog box, allowing you to select the desired source and destination for a transfer.

```
┌──────────────────────────────────────────────────────────────┐
│                  TRANSFER INSTRUMENT TO VARIABLE               │
│  Edit   Label   Comment                                        │
├────────────────────────────────────────────────────────────────┤
│  TMS Name            Driver           Port       Address       │
│  ┌──────────────────────────────────────────────────────────┐ │
│  │                                                          │ │
│  │                                                          │ │
│  │                                                          │ │
│  │                                                          │ │
│  └──────────────────────────────────────────────────────────┘ │
│  Variable:    ┌───────────────────────┐   ┌──────┐  ┌────────┐ │
│               └───────────────────────┘   │  OK  │  │ Cancel │ │
│                                            └──────┘  └────────┘ │
└────────────────────────────────────────────────────────────────┘
```

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- A list box from which you select the instrument you want for the source (by pointing and clicking with the mouse). The list shows all the instruments currently loaded into IPG.

- **Variable:** — An edit box where you enter the variable name. A string of data is read from the instrument into the variable without any modification (other than what is required by the particular bus communication protocol). If the variable type is numeric, the data is converted into either an integer or a floating point number.

- **OK** — Select this pushbutton to complete the **Instrument to Variable...** creation.

- **Cancel** — Select this pushbutton to cancel the **Instrument to Variable....**

- **Instrument to File...** — Select this menu item by pointing and clicking with the mouse, or by pressing the N keyboard key. **Instrument to File...** opens the following dialog box, allowing you to select the desired source and destination for a transfer. (If you enter *LPT1* for the File Name:, the input is sent to the printer.)

```
TRANSFER INSTRUMENT TO FILE
Edit   Label   Comment
─────────────────────────────────────────────────────
TMS Name          Driver           Port        Address




─────────────────────────────────────────────────────
File Name:      [..]         ▲    ┌────────┐   ┌──────────┐
                [library]         │   OK   │   │  Cancel  │
*.DAT           [-a-]             └────────┘   └──────────┘
                [-c-]
c:\ipg          [-d-]
                [-e-]        ▼
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- A list box from which you select the instrument you want for the source (by pointing and clicking with the mouse). The list shows all the instruments currently loaded into IPG.

- **File Name:** — An edit box where you enter the file name. The entire data transmission from the instrument is placed into the file without modification or translation.

- A disk drive/directory list box (identified with a directory path to the left of the box) containing file names that you can select as the destination, or disk drives and/or directories where other file names can be found for selection.

- **OK** — Select this pushbutton to complete the **Instrument to File...** creation.

- **Cancel** — Select this pushbutton to cancel the **Instrument to File....**

NOTE

On transfers to(WRITE) *or* from(READ) a file, the file is read or written from the beginning on each transfer, and is opened and closed on each transfer. If the file already exists, it will be *overwritten*.

- **File to Instrument...** — Select this menu item by pointing and clicking with the mouse, or by pressing the I keyboard key. **File to Instrument...** opens the following dialog box, allowing you to select the desired source and destination for a transfer.

```
                        TRANSFER FILE TO INSTRUMENT
 Edit   Label   Comment

 TMS Name              Driver            Port        Address
 ┌───────────────────────────────────────────────────────────┐
 │                                                             │
 │                                                             │
 │                                                             │
 └───────────────────────────────────────────────────────────┘

 File Name:        ┌─────────────┬──┐   ┌──────────┐   ┌──────────┐
 ┌────────────┐    │[..]         │▲ │   │   OK     │   │  Cancel  │
 │ *.DAT      │    │[library]    │  │   └──────────┘   └──────────┘
 └────────────┘    │[-a-]        │  │
 c:\ipg            │[-c-]        │  │
                   │[-d-]        │  │
                   │[-e-]        │▼ │
                   └─────────────┴──┘
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

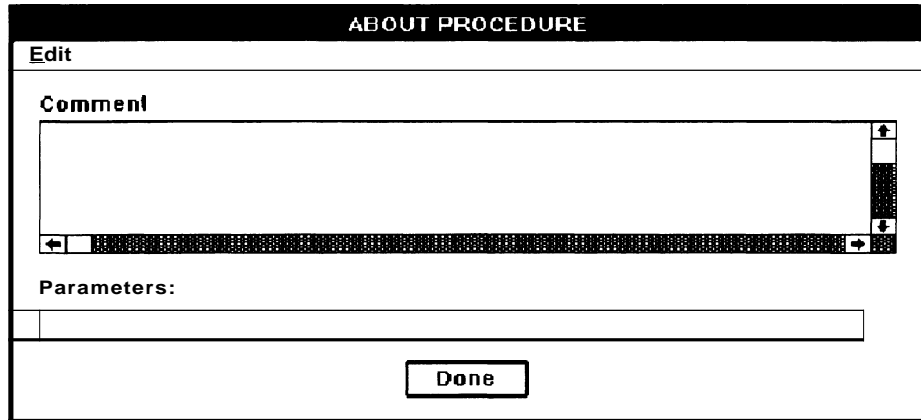**IPG** provides the following dialog box items for user interaction:

■ A list box from which you select the instrument you want for the destination (by pointing and clicking with the mouse). The list shows all the instruments currently loaded into IPG.

■ **File Name:** — A edit box where you enter the file name. The entire contents of the file are sent to the instrument without modification (other than what is required by the particular bus communication protocol).

■ A disk drive/directory list box (identified with a directory path to the left of the box) containing file names that can be selected as the source, or disk drives and/or directories where other file names can be found for selection.

■ **OK** — Select this pushbutton to complete the **File to Instrument...** creation.

■ **Cancel** — Select this pushbutton to cancel the **File to Instrument...**

NOTE

On transfers to (WRITE) or from (READ) a file, the file is read or written from the beginning on each transfer, and is opened and closed on each transfer.

File I/O

Select this item pointing to or clicking with the mouse or by pressing the L keyboard key. **File I/O** opens a the following menu list, allowing you to select the step to be generated.

```
File I/O ▶    Open ASCII Log File...
              Open CSV Log File...
              Open Sequential File...
              Print ASCII Log File...
              Print CSV Log File...
              Print Sequential File...
              Input...
              Close File...
              Delete File...
              Rewind File...
```
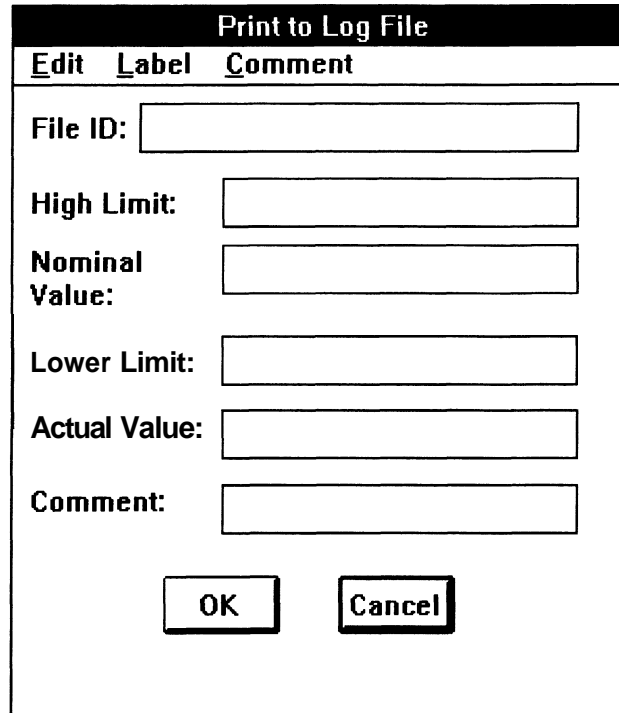
Files are identified by a numeric value. The value is associated with a DOS file by one of the **OPEN** steps. Any expression that evaluates to a positive non-zero value can be used to identify a file.

Open ASCII Log File, CSV Log File and Sequential File — The three file types use the same dialog boxes for opening the file.

```
                        File Open
  Edit   Label   Comment

  File name:  ""|

    File ID:  |

  ┌Mode─────────────┐   ┌File attributes──────┐
  │ ○ Append to existing │   │ ○ Read only          │
  │ ○ Erase existing     │   │ ○ Write only         │
  │ ● Create new         │   │ ● Read / Write       │
  │ ○ Open existing      │   └──────────────────────┘
  └─────────────────┘

            ┌─────────┐   ┌─────────┐
            │   OK    │   │ Cancel  │
            └─────────┘   └─────────┘
```
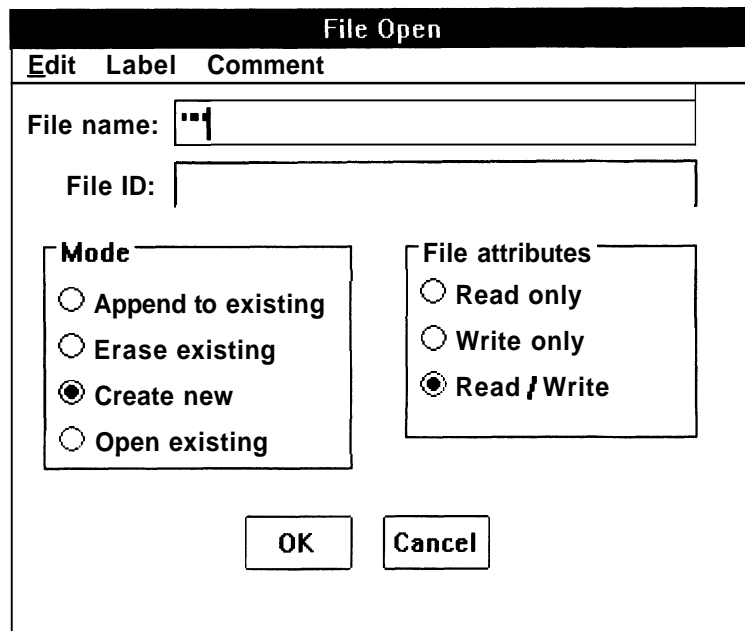
- **File name** — this edit box is for a string expression, that represents the name and path of the file. If no path is specified the current directory is used.

- **File ID** — An edit control where a floating point expression is entered. The value of the expression is the ID of the file. The ID is used in the PRINT, INPUT and CLOSE steps that deal with the file.

- **Mode** — The radiobuttons in this group deal with how the file is opened and how any existing file with the same name is treated. Only one of the radiobuttons in this group may be selected at one time.

    - **Append to existing** — If this button is selected the **OPEN** step expects the file to already exist. If it does not exist an error is displayed and execution terminated. Once the file is opened it is positioned at the end. A **EOF()** check on the file would return true, while writing to the file will add the information at the end of the file.

    - **Erase existing** — If this button is selected the **OPEN** step expects the file to already exist. If it does not exist an error is displayed and execution is terminated. If the file does exist its contents are deleted. Care must be take using this option since the previous contents of the file will be lost for ever when the **OPEN** step is executed.

    - **Create New** — If this button is selected the **OPEN** step will create an empty file. If the file already exists an error is displayed and execution is terminated.

    - **Open existing** — If this button is selected the **OPEN** step expects the file to already exist. If it does not exist an error is displayed and execution is terminated. The file marker is positioned at its beginning. The first **INPUT** from the file will return the first record in the file. While a write may write over data that was already in the file, Care must be take with this option because any existing data may be lost if the file is written to.

- **File Attributes** — The radiobuttons in this group specify how the file will be accessed in this test procedure. Only one of the radiobuttons in this group may be selected at one time.

    - **Read Only** — If this button is selected the file will be opened only for reading with the **INPUT** step. Attempts to write to a file opened in this manner will result in an error.

    - **Write Only** — If this button is selected the file will be opened only for writing to with the **PRINT** step. Attempts to read from the file will result in an error.

    - **Read/Write** — If this button is selected the file will be opened for use with both the **INPUT** and **PRINT** steps.

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog.

Print ASCII Log File & **Print CSV Log File** — Both ASCII and CSV log files use the same dialog for building their steps.

```
┌─────────────────────────────────────────────┐
│             Print to Log File                 │
│  Edit   Label   Comment                       │
│ ─────────────────────────────────────────────│
│                                               │
│  File ID:  ┌──────────────────────────────┐  │
│            └──────────────────────────────┘  │
│                                               │
│  High Limit:    ┌─────────────────────────┐  │
│                 └─────────────────────────┘  │
│  Nominal                                      │
│  Value:         ┌─────────────────────────┐  │
│                 └─────────────────────────┘  │
│                                               │
│  Lower Limit:   ┌─────────────────────────┐  │
│                 └─────────────────────────┘  │
│                                               │
│  Actual Value:  ┌─────────────────────────┐  │
│                 └─────────────────────────┘  │
│                                               │
│  Comment:       ┌─────────────────────────┐  │
│                 └─────────────────────────┘  │
│                                               │
│            ┌────────┐    ┌────────┐          │
│            │   OK   │    │ Cancel │          │
│            └────────┘    └────────┘          │
│                                               │
└─────────────────────────────────────────────┘
```

- **File ID** — this is the only required entry and is a numeric expression. The value of the File ID field is used to identify the file the log entry is to be written to. The **Open** step is used to associate the file ID with a DOS file name.

- **High Limit** — this is a numeric expression and is an optional field. When evaluated at execution its value is the upper limit for passing values.

- **Nominal Value** — this is a numeric expression and is an optional field. It is the expected value for this log entry.

- **Lower Limit** — this is a numeric expression and is an optional field. It is the lowest value that will result in a PASS on the log step.

- **Actual Value** — this is a numeric expression and is an optional field. It is the value that will be used to make the PASS/LOW/HIGH determination.

- **Comment** — this is a string expression. If present its value is used as the comment for the log file entry.

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog.

Print —The print step is used to write data into a sequential file.

```
┌─────────────────────────────────────────────────┐
│                      PRINT                        │
│  Edit   Label   Comment                           │
│ ┌───────────────────────────────────────────────┐│
│ │                                                 ││
│ │  File ID:  │                                    ││
│ │                                                 ││
│ │  Print list: ┌───────────────────────────────┐ ││
│ │              └───────────────────────────────┘ ││
│ │            ┌─────────┐      ┌─────────┐         ││
│ │            │   Ok    │      │ Cancel  │         ││
│ │            └─────────┘      └─────────┘         ││
│ └───────────────────────────────────────────────┘│
└─────────────────────────────────────────────────┘
```

- **File ID** — is a numeric expression, used as the file ID. When the step is executed the ID must match the ID of a currently opened file.

- **Print List** — the print list is a list of one or more expression separated by commas or semicolon. The end of the list may also have a comma or semicolon. The expression may be either numeric or string expression. Waveform variables are not support by the print step.

  The expressions in the print list are evaluated starting at the left most, converted to ASCII text strings and written to the file whose ID is in **File ID**. When a comma is encountered in the print list a tab character (ASCII code 9) is written out to the file. Nothing is written out to the file when a semicolon is encountered. If the print list ends with neither a comma nor a semicolon a carriage return, line feed sequence is written to the file to mark the end of the record.

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog.

Input — The **Input** step is used to read data from a sequential file. Each time an input step is executed a single record is read, and one or more variables step to the read values. A record in a sequential file is delimited by a carriage return line feed pair.

```
                    ┌──────────────────────────────────────┐
                    │               Input                  │
                    │ Edit   label   Comment               │
                    │                                      │
                    │ File ID:                             │
                    │ ┌──────────────────────────────┐     │
                    │ │                              │     │
                    │ └──────────────────────────────┘     │
                    │                                      │
                    │ Variable List                        │
                    │ ┌──────────────────────────────────┐ │
                    │ │                                  │ │
                    │ └──────────────────────────────────┘ │
                    │                                      │
                    │        ┌────────┐   ┌────────┐       │
                    │        │   OK   │   │ Cancel │       │
                    │        └────────┘   └────────┘       │
                    │                                      │
                    └──────────────────────────────────────┘
```

- **File ID** — is a numeric expression, used as the file ID. When the step is executed the ID must match the ID of a currently opened file.

- **Variable list** — is a list of one or more variables, separated by commas. The variables maybe integers, floats, or strings. Waveform variables are not allowed in an input step. The variable may also be a reference to an array such as:

      a[5] or x$[i+4]

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog.

When the **Input** step is executed a record is read from the file and values are assigned to the variables in the input list start from the left. If there are more variables in the list then data in the record and error message is generated and execution is stopped. While if there is unused data after the last variable has been assigned a value it is ignored. Data left over from one **Input** step is <u>not</u> read by the next input.

The data is broken into pieces to be assigned to variables by comma's or tabs (these are the field delimiters.) Use a comma or tab in data to be read into a string variable. Surround the data with semicolons. The following examples show the data file record, variable list and the final values of the variables.

Data file: `123,hello out there,0.3e5`
Variable list: `i&,s$,x#`
Values after input:

      i&   **is**   `123`
      s$ **is**   `"hello out there"`
      x#   **is**   `0.3E5`

Data file: `"123,hello", 3.141`
Variable List: `s$,pi#`

Values after input:

```
s$    is    "123,hello"
pi#   is    3.141
```

If the variable type and the type of data in the file are not compatible an error message is generated and execution terminated.

Rewind — The **Rewind** step is used to reposition a file to its starting point. After a **Rewind** step the next **Input** will read the first record of the file.

```
┌─────────────────────────────────────┐
│             REWIND                   │
├─────────────────────────────────────┤
│ Edit   Label   Comment               │
├─────────────────────────────────────┤
│ File ID:                             │
│                                      │
│ ┌─────────────────────────────────┐ │
│ │                                 │ │
│ └─────────────────────────────────┘ │
│                                      │
│      ┌──────┐      ┌────────┐        │
│      │  OK  │      │ Cancel │        │
│      └──────┘      └────────┘        │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

- **File ID** — is a numeric expression. The value of the expression is the ID of the file to be rewound. The file must be open when the command is executed.

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog

Delete — The **Delete** step is used to delete a file. It is equivalent to the DOS **DEL** command. Care must be used when using this test since the information in a deleted file may not be recoverable. No error message is generated if the file to be deleted does not exist.

```
┌─────────────────────────────────────┐
│            Delete File               │
├─────────────────────────────────────┤
│ Edit   Label   Comment               │
├─────────────────────────────────────┤
│ File name:                           │
│                                      │
│ ┌─────────────────────────────────┐ │
│ │ ▪▪▪                             │ │
│ └─────────────────────────────────┘ │
│                                      │
│      ┌──────┐      ┌────────┐        │
│      │  OK  │      │ Cancel │        │
│      └──────┘      └────────┘        │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

- **File Name** — is a string expression. The value of the string expression is the name of the file to be deleted. If no path or drive is specified the current directory is assumed.

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog.

Close — Select this menu item by selecting **Close** in the **File I/O** sub menu. The **Close** step is used when a file will no longer be used by the test program. Until the **Close** is executed the file will be unavailable to other programs.

```
┌──────────────────────────────────┐
│            CLOSE                 │
├──────────────────────────────────┤
│  Edit  Label   Comment           │
│ ─────────────────────────────── │
│                                  │
│   File ID: │┃              │     │
│            └──────────────┘      │
│                                  │
│        ┌──────┐   ┌────────┐    │
│        │  Ok  │   │ Cancel │    │
│        └──────┘   └────────┘    │
│                                  │
└──────────────────────────────────┘
```

- **File ID** — An edit control where a floating point expression is entered. The value of the expression is the ID of the file. The ID was associated with a file by an OPEN step.

- **Ok** — Select this pushbutton to complete the **Open** dialog.

- **Cancel** — Select this pushbutton to cancel the **Open** dialog.

On Event

Select this menu item by pointing and clicking with the mouse, or by pressing the V keyboard key. **On Event...** opens the following dialog box, allowing you to select an event handler (test procedure file name) to which program control is transferred whenever a selected event occurs. Checking for events is done after each test procedure step.

```
┌─────────────────────────────────────────────────────┐
│                     ON EVENT                          │
│  Edit    Label    Comment                             │
│ ┌───────────────────────────────────────────────────┐ │
│ │ Test Procedure:          Event:                   │ │
│ │ ┌──────────────────┐      ☐ SRQ        ┌─────────┐ │ │
│ │ │I                 │                   │ About   │ │ │
│ │ └──────────────────┘      ☐ Timeout    └─────────┘ │ │
│ │ c:\ipg                                 ┌─────────┐ │ │
│ │ ┌──────────────────┐▲     ☐ VXI Event  │  OK     │ │ │
│ │ │test.prg          │                   └─────────┘ │ │
│ │ │[..]              │                   ┌─────────┐ │ │
│ │ │[library]         │     ◉ Enable      │ Cancel  │ │ │
│ │ │[-a-]             │                   └─────────┘ │ │
│ │ │[-c-]             │     ○ Disable                 │ │
│ │ │[-d-]             │                               │ │
│ │ │[-e-]            ▼│                               │ │
│ │ └──────────────────┘                               │ │
│ │ Parameters:                                        │ │
│ └───────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────┘
```

- ■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key, **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- ■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- ■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- ■ **Test Procedure:** — An edit box where you enter the name of a test procedure file to which program control will be transferred when the event specified by this step occurs. This file name can be a new name for a procedure that is to be created later, or a name from the list box of test procedure file names. If you use a file from the list box, you can enter the name from the keyboard, or select it from the list box by pointing and clicking the mouse.

- ■ A disk drive:\directory\file list box (identified with a disk drive:\directory path above the box) containing a list of the available test procedure files to which you can transfer program control when specified events occur.

■ **Parameters:** — An edit box where you enter the required parameters (variable names) that must be passed to the **Test Procedure:** file. You must enter these parameters in the order required by the procedure, and you must separate multiple parameters with commas. If the **Test Procedure:** file has already been created, select its name from the list box and then select the **About** pushbutton to list its required parameters.

NOTE

Only variables can be passed as parameters; passing constants will cause an error.

■ **Event:** — The group name for the **SRQ, Timeout**, and **VXI Event** check boxes. Select these check boxes to cause program execution to transfer to a selected **Test Procedure:** when the event occurs.

　■ **SRQ** — When selected, **SRQ** causes program execution to transfer whenever an IEEE 488 (GPIB) SRQ event occurs.

　■ **Timeout** — When selected, **Timeout** causes program execution to transfer whenever a program timeout event occurs.

■ **Enable** — Selecting this radiobutton reverses the action of the following Disable radiobutton.

■ **Disable** — Selecting this radiobutton will temporarily disable the interrupt handler selected, but does not delete it.

■ **About** — If you select this pushbutton, the following dialog box appears and lists any comments attached to the selected **Test Procedure:,** as well as the **Parameters:** necessary for that procedure. (You should attach appropriate comments listing the parameters for the test procedure to the PROCEDURE step.)
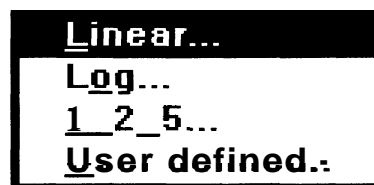
　■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

```
                    ABOUT PROCEDURE
 Edit
─────────────────────────────────────────────────────────
 Comment
 ┌──────────────────────────────────────────────────┬─┐
 │                                                    │↑│
 │                                                    ├─┤
 │                                                    │▓│
 │                                                    │▓│
 │                                                    ├─┤
 │                                                    │↓│
 ├─┬──────────────────────────────────────────────┬─┤─┘
 │←│▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓│→│
 └─┴──────────────────────────────────────────────┴─┘
 Parameters:
 ┌──────────────────────────────────────────────────────┐
 │                                                        │
 └──────────────────────────────────────────────────────┘
                        ┌─────────────┐
                        │    Done     │
                        └─────────────┘
```

IPG provides the following dialog box items for user interaction:

- **Comment** — This box shows any comments that have been added to the selected **Test Procedure:**.

- **Parameters:** — This box shows the parameters necessary for running the selected **Test Procedure:**.

- **Done** — Select this pushbutton to close the **About Procedure** dialog box and return to the **On Event** dialog box.

- **OK** — Select this pushbutton to complete the **On Event...** creation.

- **Cancel** — Select this pushbutton to cancel the **On Event....**

On Abort

Select this menu item by pointing and clicking with the mouse, or by pressing the B keyboard key. **On Abort...** opens the following dialog box, allowing you to select an interrupt handler (test procedure file name) that program control transfers to whenever an ABORT event occurs. An ABORT event occurs when you press the CTRL and C keyboard keys simultaneously, or when you select **Abort** in a display step. Checking for an ABORT is done after each test procedure step.

```
              ON ABORT
 Edit   Label   Comment
─────────────────────────────────
 Test Procedure:
 ┌──────────────────────┐  ┌────────────┐
 │[|                    │  │   About    │
 └──────────────────────┘  └────────────┘
 c:\ipg
 ┌──────────────────────┬─┐┌────────────┐
 │test.prg             │↑││     OK     │
 │[..]                 │ │└────────────┘
 │[library]            │▓│
 │[-a-]                │▓│┌────────────┐
 │[-c-]                │▓││  Cancel    │
 │[-d-]                │ │└────────────┘
 │[-e-]                │↓│ ◉ Enable
 └──────────────────────┴─┘ ○ Disable
 Parameters:
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Test Procedure:** — An edit box where you enter the name of a test procedure file to which program control will be transferred when an ABORT occurs. This file name can be a new name for a procedure that is to be created later, or a name from the list box of test procedure file names. If you use a file from the list box, you can be enter the name with the keyboard, or select it from the list box by pointing and clicking the mouse.

- A disk drive:\directory\file list box (identified with a disk drive:\directory path above the box) containing a list of the available test procedure files to which you can transfer program control when an abort occurs.

- **Parameters:** — An edit box where you enter the required parameters (variable names) that must be passed to the **Test Procedure:** file. You must enter these parameters in the order required by the procedure, and you must separate multiple parameters with commas. If the Test Procedure: file has already been created, select its name from the list box and then select the **About** pushbutton to list its required parameters.

NOTE

Only variables can be passed as parameters; passing constants will cause an error.

- **Enable** — Selecting this radiobutton reverses the action of the following **Disable** radiobutton.

- **Disable** — Selecting this radiobutton will disable the interrupt handler selected, but does not delete it.

■ **About** — If you select this pushbutton, the following dialog box appears and lists any comments attached to the selected **Test Procedure:,** as well as the **Parameters:** necessary for that procedure.

  ■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

```
┌──────────────────────────────────────────────────────────────┐
│                      ABOUT PROCEDURE                           │
├──────────────────────────────────────────────────────────────┤
│ Edit                                                           │
│                                                                │
│  Comment                                                       │
│  ┌───────────────────────────────────────────────────────┬─┐ │
│  │                                                         │▲│ │
│  │                                                         │ │ │
│  │                                                         │ │ │
│  │                                                         │▼│ │
│  ├─┬─────────────────────────────────────────────────┬─┬─┘ │
│  │◄│                                                   │►│   │
│  └─┴───────────────────────────────────────────────────┴─┘  │
│  Parameters:                                                  │
│  ┌────────────────────────────────────────────────────────┐ │
│  │                                                          │ │
│  └────────────────────────────────────────────────────────┘ │
│                      ┌──────────┐                            │
│                      │   Done   │                            │
│                      └──────────┘                            │
└──────────────────────────────────────────────────────────────┘
```
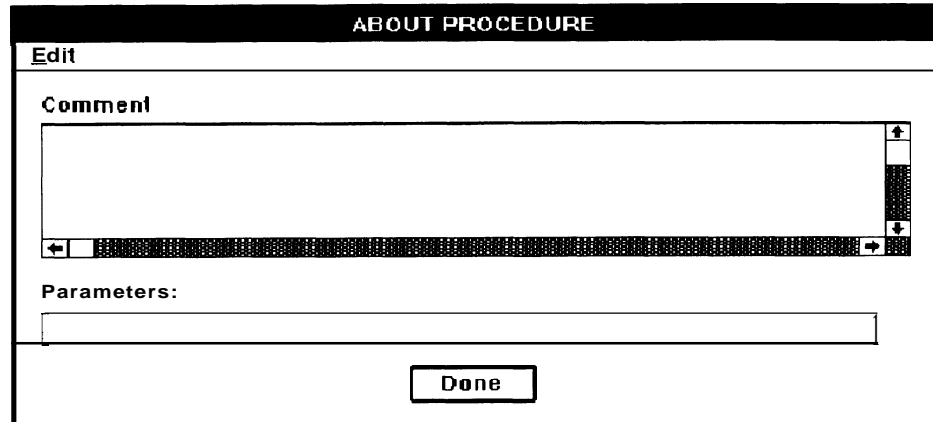
IPG provides the following dialog box items for user interaction:

■ **Comment** — This box shows any comments that have been added to the selected Test Procedure:

■ **Parameters:** — This box shows the parameters necessary for running the selected **Test Procedure:.**

■ **Done** — Select this pushbutton to close the **About** dialog box and return to the **On Abort** dialog box.

■ **OK** — Select this pushbutton to complete the **On Abort...** creation.

■ **Cancel** — You can select this pushbutton to cancel the **On Abort....**

Delay

Select this menu item by pointing and clicking with the mouse, or by pressing the D keyboard key. **Delay...** opens the following dialog box, allowing you to enter a delay period into a test procedure.

```
┌────────────────────────────────────┐
│               DELAY                 │
├────────────────────────────────────┤
│  Edit   Label   Comment             │
│  ┌──────────────────┐               │
│  │                  │  Milliseconds │
│  └──────────────────┘               │
│    ┌──────────┐   ┌──────────┐      │
│    │    OK    │   │  Cancel  │      │
│    └──────────┘   └──────────┘      │
└────────────────────────────────────┘
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Milliseconds:** — An edit box where you enter a value representing the desired procedure delay in milliseconds.

- **OK** — Select this pushbutton to complete the **Delay...** creation.

- **Cancel** — Select this pushbutton to cancel the **Delay....**

Remark

Select this menu item by pointing and clicking with the mouse, or by pressing the M keyboard key. **Remark...** opens the following dialog box, allowing you to enter remark text to a test procedure step.

NOTE

You can view all remarks in a test procedure (without displaying other procedure steps), by selecting **Options** from the Main Menu bar, then selecting **Remarks Only.**
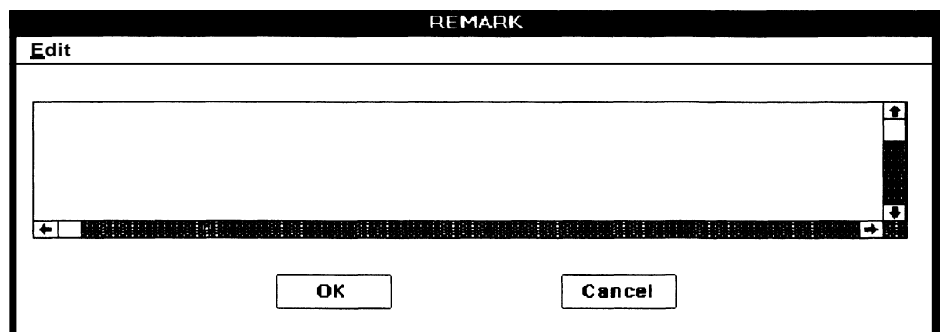
■ Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ An untitled edit box where you enter the remark text to be displayed in the test procedure outline. (The remark text is played above the step in which you enter it.)

If the remark text on the display exceeds 75 characters, IPG replaces the last three characters (of the 75) and the remaining text with an ellipsis (. . .) to indicate that the remark is longer than one line. In order for you to read the entire remark, you must double-click on the REMARK step to open the dialog box, or print the full procedure by selecting the Full radiobutton from the Print dialog box under the File Menu.

■ **OK** — Select this pushbutton to complete the **Remark...** creation.

■ Cancel — Select this pushbutton to cancel the Remark**...**

Include

Select this menu item by pointing and clicking with the mouse, or by pressing the N keyboard key. Include opens the following menu list allowing you to enter programming constructs or procedures that are not suited to IPG capabilities. Data entered with an INCLUDE step will be converted with the test program into the C programming language (using the Translate Menu). IPG ignores text or file names entered with Include during normal test execution.

■ **Te**xt... — Select this menu item by pointing and clicking with the mouse, or by pressing the T keyboard key. **Te**xt... causes the following dialog box to appear, allowing you to enter text that will be used when translating the test procedure to the C programming language.

```
                    INCLUDE TEXT
Text:
┌─────────────────────────────────────────────────┬─┐
│ │                                                 │▲│
│                                                   │ │
│                                                   │ │
│                                                   │ │
│                                                   │ │
│                                                   │ │
│                                                   │ │
│                                                   │▼│
├─┬─────────────────────────────────────────────┬──┼─┤
│←│▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓│  │→│
    ┌──────────┐           ┌──────────┐
    │    OK    │           │  Cancel  │
    └──────────┘           └──────────┘
```
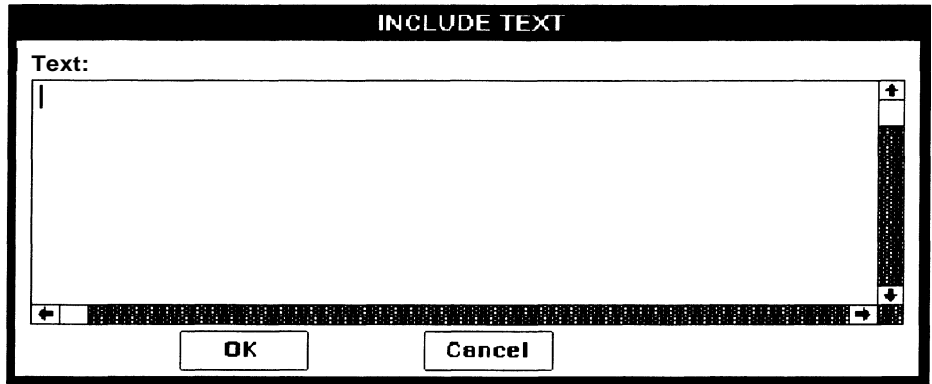
An include step lets you add C specific code to your test procedure and now you only maintain one copy of the test. You do not have to modify the translated C code.

IPG provides the following dialog box items for user interaction:

- **Text:** — An edit box where you enter the desired text.

   OK — Select this pushbutton to complete the **Text...** creation.

- **Cancel** — Select this pushbutton to cancel the **Text....**

- **File...** — Select this menu item by pointing and clicking with the mouse, or by pressing the F keyboard key. **File...** causes the following dialog box to appear, allowing you to enter a file name that will be used when translating the test procedure to the C programming language. A C #Include filename step will be generated in the C code.

```
┌───────────────────────────────────────────┐
│              INCLUDE FILE                   │
├───────────────────────────────────────────┤
│  Edit    Label    Comment                   │
├───────────────────────────────────────────┤
│  Filename:                                  │
│  ┌──────────────────────────────┐          │
│  │ │                            │          │
│  └──────────────────────────────┘          │
│  c:\ipg                                     │
│  ┌──────────────────────┐  ┌────────────┐  │
│  │ [..]                 │  │            │  │
│  │ [library]            │  │            │  │
│  │ I-a-I                │  │     OK     │  │
│  │ [-c-]                │  │            │  │
│  │ [-d-]                │  └────────────┘  │
│  │ [-e-]                │                  │
│  │ [-f-]                │  ┌────────────┐  │
│  │                      │  │   Cancel   │  │
│  └──────────────────────┘  └────────────┘  │
└───────────────────────────────────────────┘
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Filename:** — An edit box where you enter the desired file name. You can enter the file name using the keyboard keys, or you can point and click with the mouse on a file name in the following list box.

- A disk drive:\directory\file list box (identified with a disk drive:\directory path above the box) containing a list of the available test procedure files to which you can transfer program control when an abort occurs.

- **OK** — Select this pushbutton to complete the **File...** creation.

- **Cancel** — Select this pushbutton to cancel the **File....**

If Then Else
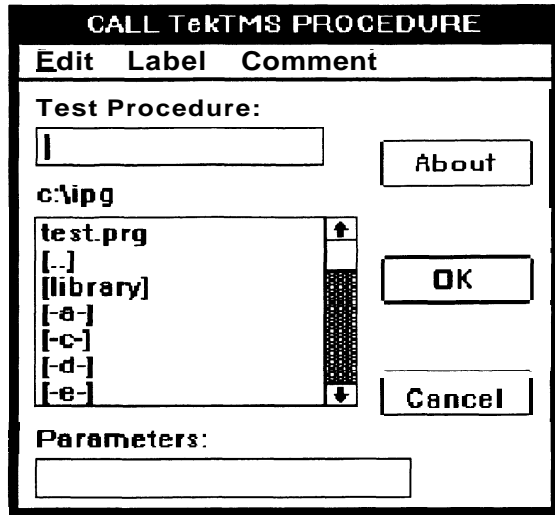
Select this menu item by pointing and clicking with the mouse, or by pressing the I keyboard key. **If Then Else...** opens the following dialog box, allowing you to create an IF-THEN-ELSE comparison and flow control test procedure step.

An IF-THEN-ELSE construct has a typical form of:

IF <expression> THEN <statement> ELSE <statement> END−IF

If Then Else... creates a test procedure step of:

IF <expression> THEN
ELSE
END−IF

The user must enter the <statement> steps.

```
┌─────────────────────────────────────────┐
│           IF THEN ELSE END_IF            │
├─────────────────────────────────────────┤
│  Edit   Label   Comment                  │
├─────────────────────────────────────────┤
│  Expression:    _____      │
│                                          │
│         ┌────────┐      ┌────────┐       │
│         │   OK   │      │ Cancel │       │
│         └────────┘      └────────┘       │
└─────────────────────────────────────────┘
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

- Label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Expression:** — An edit box where you enter the comparison expression, which must evaluate to zero (false) or non-zero (true). The edit box will horizontally scroll up to 255 characters.

- **OK** — Select this pushbutton to complete the **If Then Else...** creation.

  Cancel — Select this pushbutton to cancel the **If Then Else....**

While Do

Select this menu item by pointing and clicking with the mouse, or by pressing the W keyboard key. **While Do...** opens the following dialog box, allowing you to enter a WHILE-DO construct into a test procedure step.

A WHILE-DO construct has a typical form of:

```
WHILE <expression> DO
<statement>
END-WHILE
```

The action of this dialog box creates a test procedure step of:

```
WHILE <expression> DO
END-WHILE
```

The user must enter the `<statement>` step.

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Expression:** — An edit box where you enter the comparison expression that must evaluate to zero (false) or non-zero (true). The edit box will horizontally scroll up to 255 characters.

- **OK** — Select this pushbutton to complete the **While Do...** creation.

- **Cancel** — Select this pushbutton to cancel the **While Do....**

For Next

Select this menu item by pointing and clicking with the mouse, or by pressing the F keyboard key. **For Next...** opens the following menu list, allowing you to select the type of incrementing sequence to be used when creating a program looping test procedure step.

```
Linear...
Log...
1_2_5...
User defined.:
```

- **Linear...** — Select this menu item by pointing and clicking with the mouse, or by pressing the L keyboard key. **Linear...** opens the following dialog box, allowing you to set the loop parameters for a linear incrementing sequence.

A FOR-NEXT linear construct has a typical form of:

```
FOR <variable> = <start> TO <end> <SIZE|STEP>
<increment|steps> <increment type>
<statement>
NEXT
```

When you select a linear loop type and enter an increment size, **Linear...**
creates a test procedure step of:

```
FOR <variable> = <start> TO <end> SIZE <increment>
LINEAR
NEXT
```

The user must enter the $<statement>$ step. If you change the method
of incrementing, the test procedure step changes accordingly. For
example, if you change the method of incrementing to a number of
steps, the word SIZE changes to STEPS.

- **Edit** — Select this menu item by pointing and clicking with the
  mouse, or by pressing and holding the ALT keyboard key while
  pressing the E key. **Edit** allows you to edit the dialog box items.
  Refer to the Edit Menu description (previously given in this section)
  for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the
  mouse, or by pressing and holding the ALT keyboard key while
  pressing the L key, **Label** allows you to add labels to this step. Refer
  to the Common Dialog Boxes description (given at the beginning of
  this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the
  mouse, or by pressing and holding the ALT keyboard key while
  pressing the C key. **Comment** allows you to add comments to this
  step. Refer to the Common Dialog Boxes description (given at the
  beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

  Start Value: — An edit box where you enter the starting value of the
  FOR-NEXT loop.

- **End Value:** — An edit box where you enter the ending value of the
  FOR-NEXT loop.

- **Number of Steps:** — An edit box where you enter the number of
  steps the FOR-NEXT construct will execute. If you make an entry in
  this box, **Increment Size:** will be displayed in gray.

- Increment Size: — An edit box where you enter the size of the loop increment. If you make an entry in this box, Number **of** Steps: is displayed in gray.

m Variable: — An edit box where you enter the FOR-NEXT variable name.

- OK — Select this pushbutton to complete the Linear**...** creation.

- Cancel — Select this pushbutton to cancel the Linear**....**

- **Log...** — Select this menu item by pointing and clicking with the mouse, or by pressing the O keyboard key. **Log...** opens the following dialog box, allowing you to set the FOR-NEXT construct parameters for a loop having a logarithmic incrementing sequence.

A FOR-NEXT log construct has a typical form of:

```
FOR <var> = <start> TO <end> STEP <steps>
<increment type>
<statement>
NEXT
```

When you select a logarithmic loop type and set the number of steps, Log**...** creates a test procedure step of:

```
FOR <variable> = <start> TO <end> STEP <steps> LOG
NEXT
```

The user must enter the $<statement>$ step.

```
┌─────────────────────────────────────────────┐
│              FOR NEXT LOG                     │
│  Edit   Label   Comment                       │
│                                               │
│  Start Value:              End Value:         │
│  ┌────────────────────┐   ┌────────────────┐ │
│  │I                   │   │                │ │
│  └────────────────────┘   └────────────────┘ │
│  Number of Steps:          Increment Size:    │
│  ┌────────────────────┐   ┌────────────────┐ │
│  │                    │   │                │ │
│  └────────────────────┘   └────────────────┘ │
│  Variable:   ┌──────────────────────────────┐│
│              └──────────────────────────────┘│
│      ┌────────────┐      ┌────────────┐       │
│      │    OK      │      │   Cancel   │       │
│      └────────────┘      └────────────┘       │
└─────────────────────────────────────────────┘
```

- Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.
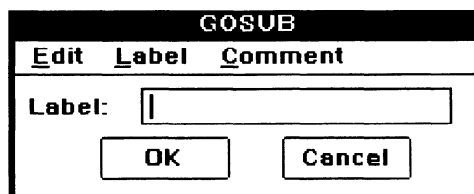
- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common *Dialog* Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Start Value:** — An edit box where you enter the starting value of the FOR-NEXT loop.

- **End Value:** — An edit box where you enter the ending value of the FOR-NEXT loop.

- **Number of Steps:** — An edit box where you enter the number of steps the FOR-NEXT construct will execute.

NOTE

IPG will calculate the appropriate logarithmic step increments for executing the FOR-NEXT construct.

- **Variable:** — An edit box where you enter the FOR-NEXT variable name.

- **OK** — Select this pushbutton to complete the **Log...** creation.

- **Cancel** — Select this pushbutton to cancel the **Log....**

- **1_2_5...** — You can select this command by pointing and clicking with the mouse, or by pressing the 1 keyboard key. **1_2_5...** opens the following dialog box allowing you to set the FOR-NEXT construct parameters for a loop having a 1_2_5 incrementing sequence.

A FOR-NEXT 1_2_5 construct has a typical form of:

```
FOR <variable> = <start> TO <end> <increment type>
<statement>
NEXT
```

and creates a test procedure step of:

```
FOR <variable> = <start> TO <end> 1_2_5
NEXT
```

The user must enter the `<statement>` step.

```
┌──────────────────────────────────────────────────────────┐
│                     FOR NEXT 1-2-5                         │
│  Edit   Label    Comment                                   │
│  ────────────────────────────────────────────────────     │
│  Start Value:                    End Value:                │
│  ┌──────────────────────┐        ┌──────────────────────┐ │
│  │                      │        │                      │ │
│  └──────────────────────┘        └──────────────────────┘ │
│  Number of Steps:                Increment Size:           │
│  ┌──────────────────────┐        ┌──────────────────────┐ │
│  │                      │        │                      │ │
│  └───────────┌────────────────────────────────────────┐──┘ │
│  Variable:   │                                        │    │
│              └────────────────────────────────────────┘    │
│            ┌────────────────┐      ┌────────────────┐      │
│            │      OK        │      │     Cancel     │      │
│            └────────────────┘      └────────────────┘      │
└──────────────────────────────────────────────────────────┘
```

- ■ Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.
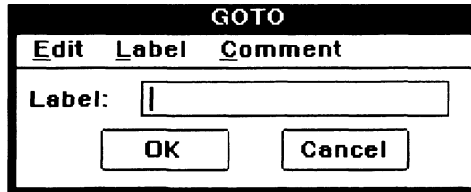
- ■ Label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- ■ Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- ■ Start Value: — An edit box where you enter the starting value for the FOR-NEXT loop.

- ■ End Value: — An edit box where you enter the ending value for the FOR-NEXT loop.

NOTE

IPG calculates the appropriate loop step values.

- ■ Variable: — An edit box where you enter the FOR-NEXT variable name.

- ■ **OK** — Select this pushbutton to complete the **1_2_5...** creation.

- ■ Cancel — Select this pushbutton to cancel **1_2_5...**.

User Defined... — Select this menu item by pointing and clicking with the mouse, or by pressing the U keyboard key. **User Defined...** opens the following dialog box, allowing you to set the FOR-NEXT construct parameters for a loop having a user-defined incrementing sequence. This allows you to use a special application of the FOR-NEXT construct to build a list whose values are stored in user-defined positions within the list. For descriptive purposes, this application is simply defined as:

```
For Position
Variable[Position] = Value
Next
```

where `Value` is accessible only within the FOR-NEXT loop, and only at each iteration.

When you select a user-defined loop type, **User Defined...** creates a test procedure step of:

```
FOR <variable> USER DEFINED <value> <value> ...
NEXT
```


- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

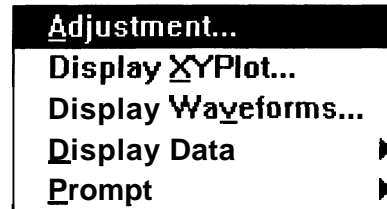IPG provides the following dialog box items for user interaction:

- **Value:** — An edit box where you enter the value to be stored in the lists `Variable[`*`Position`*`]` element. Value: can be constants, variables, or expressions, but must be numeric.

- **Position:** — An edit box where you enter the index value of the loop position.

- **Variable:** — An edit box where you enter the FOR-NEXT variable name.

- **Defined Values:** — This list box shows the **Value:** in the **Position:** order specified when you select the **Add** pushbutton.

- **Add** — Select this pushbutton to complete the addition of a new **Position:** and its **Value:.**

- **Change** — Select this pushbutton to implement any changes to **Position:** or **Value:** that you have made by editing with the keyboard.

- **Delete** — Select this pushbutton to delete any highlighted **Value:** from the **Defined Values:** list.

- OK — Select this pushbutton to complete the **User Defined...** creation.

- **Cancel** — Select this pushbutton to cancel the **User Defined....**

Exit For Next

Select this menu item by pointing and clicking with the mouse, or by pressing the R keyboard key. **Exit For Next...** allows you to create an `EXIT` step within a FOR-NEXT test procedure loop, so that program control can be transferred from the FOR-NEXT loop before normal loop completion. **Exit For Next...** also opens the following dialog box, allowing you to add a label or comment to the `EXIT` step.

```
┌─────────────────────────────┐
│        EXIT FOR NEXT        │
│  Label   Comment            │
│   ┌──────────┐ ┌──────────┐ │
│   │   OK     │ │  Cancel  │ │
│   └──────────┘ └──────────┘ │
└─────────────────────────────┘
```

- m **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **OK** — Select this pushbutton to complete the **Exit For Next** creation.

- **Cancel** — Select this pushbutton to cancel the **Exit For Next.**

Call Procedure

Select this menu item by pointing and clicking with the mouse, or by pressing the P keyboard key. **Call Procedure** opens the following menu list, allowing you to create a test program step that transfers program control to another test procedure.

```
TekTMS Procedure...
External Procedure...
```

```
CAUTION
```

When calling other procedures into your test procedure, make certain that any instrument driver *(.ISD)* files that are used by the other procedure are already loaded by the Main Procedure.

- **TekTMS Procedure...** — Select this menu item by pointing and clicking with the mouse, or by pressing the P keyboard key. **TekTMS Procedure...** opens the following dialog box, allowing you to select a TekTMS test procedure to which program control will be transferred.

```
┌─────────────────────────────────────┐
│      CALL TekTMS PROCEDURE          │
├─────────────────────────────────────┤
│  Edit   Label   Comment             │
│                                     │
│  Test Procedure:                    │
│  ┌─────────────────────┐  ┌───────┐ │
│  │ I                   │  │ About │ │
│  └─────────────────────┘  └───────┘ │
│  c:\ipg                             │
│  ┌───────────────────┬─┐            │
│  │ test.prg          │▲│  ┌───────┐ │
│  │ [..]              │ │  │  OK   │ │
│  │ [library]         │▓│  └───────┘ │
│  │ [-a-]             │▓│            │
│  │ [-c-]             │▓│            │
│  │ [-d-]             │ │  ┌───────┐ │
│  │ [-e-]             │▼│  │Cancel │ │
│  └───────────────────┴─┘  └───────┘ │
│  Parameters:                        │
│  ┌───────────────────────┐          │
│  │                       │          │
│  └───────────────────────┘          │
└─────────────────────────────────────┘
```

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **Test Procedure:** — An edit box where you enter the name of the test procedure file that you want program control to be transferred to. This name can be for a new file that has not been created, or you can select the name from the following list box (by pointing and clicking the mouse).

■ A list box (identified with a disk drive:\directory path above the box) containing a disk drive:\directory\file list of test procedure files to which you can transfer program control.

■ **Parameters:** — An edit box where you enter parameters that must be passed to the **Test Procedure:** file. You must enter these parameters in the order required by the procedure, and you must separate multiple parameters with commas. If the procedure has already been created, you can select its name from the list box and select the **About** pushbutton to list its required parameters.

Only variables may be passed as parameters; constants are not allowed.

- **About** — If you select this pushbutton, the following dialog box appears and lists any comments attached to the selected **Test Procedure:,** as well as the **Parameters:** necessary for that procedure.

NOTE

Comments attached to a procedure for viewing with About should be attached to the PROCEDURE statement of that procedure.
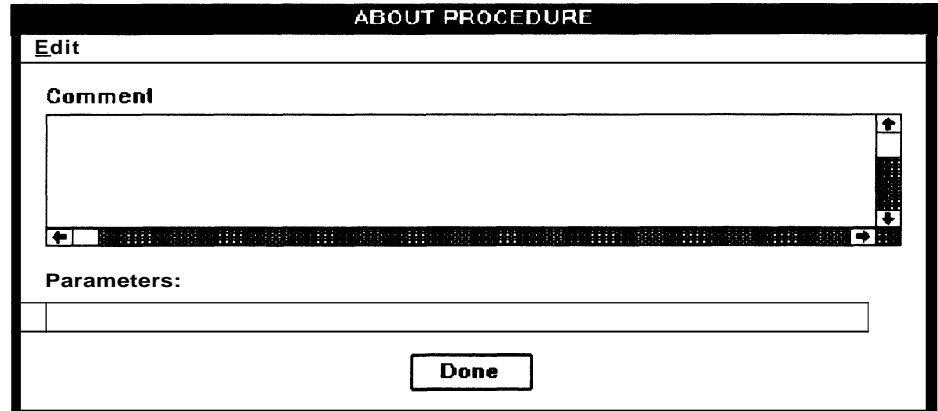
- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- *8* **Comment** — This box shows any comments that have been added to the selected **Test Procedure:.**

- **Parameters:** — This box shows the parameters necessary for running the selected Test Procedure:

- **Done** — Select this pushbutton to close the dialog box and return to the **On Event** dialog box.

- **OK** — Select this pushbutton to complete the **TekTMS Procedure...** creation.

Cancel — Select this pushbutton to cancel the **TekTMS Procedure....**

External Procedure... — Select this menu item by pointing and clicking with the mouse, or by pressing the E key. **External Procedure...** opens the following dialog box, allowing you to select an external test procedure to which program control is to be transferred (after the test procedure is translated into the C programming language). The Run Time Generator (RTG) will make all name conversions from IPG variable names to C variable names, enabling you to use your variable names in the parameter list. The called procedure must know the data types used by RTG when it translated the programs to C. Refer to the RTG Programmers Reference Manual for further information.

```
┌─────────────────────────────────────────────┐
│          CALL EXTERNAL PROCEDURE             │
├─────────────────────────────────────────────┤
│  Edit    Label    Comment                    │
├─────────────────────────────────────────────┤
│  Procedure name:                             │
│  ┌─────────────────────────────────────────┐ │
│  │ I                                       │ │
│  └─────────────────────────────────────────┘ │
│                                              │
│  Parameters:                                 │
│  ┌─────────────────────────────────────────┐ │
│  │                                         │ │
│  └─────────────────────────────────────────┘ │
│                                              │
│     ┌──────────┐        ┌──────────┐         │
│     │    OK    │        │  Cancel  │         │
│     └──────────┘        └──────────┘         │
└─────────────────────────────────────────────┘
```

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

Procedure Name: — An edit box where you enter the name of the external procedure desired.

Parameters: — This box shows the parameters necessary for running the selected **Test Procedure:.**

- **OK** — Select this pushbutton to complete the External Procedure**...** creation.

- Cancel — Select this pushbutton to cancel the External Procedure**....**

Exit Procedure

Select this menu item by pointing and clicking with the mouse, or by pressing the X keyboard key. Exit Procedure**...** opens the following dialog box, allowing you to create a test procedure step, within the current procedure, that will exit the procedure before the end of the procedure is reached.

```
┌─────────────────────────────────┐
│        EXIT PROCEDURE           │
│  Label   Comment                │
├─────────────────────────────────┤
│   ┌─────────┐   ┌──────────┐    │
│   │  :OK:   │   │  Cancel  │    │
│   └─────────┘   └──────────┘    │
└─────────────────────────────────┘
```

- label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **OK** — Select this pushbutton to complete the Exit Procedure**...** creation.

- Cancel — Select this pushbutton to cancel the Exit Procedure**....**
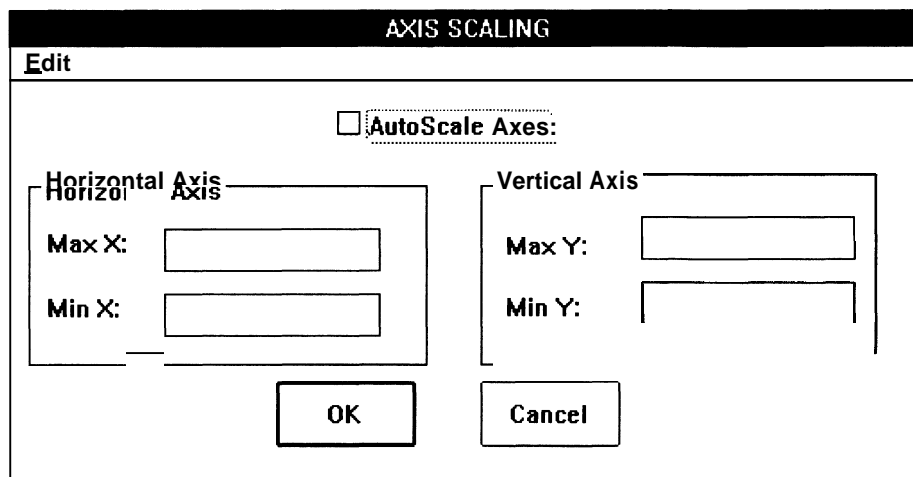
Stop Test

Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. Stop Test**...** opens the following dialog box, allowing you to create a test procedure step that stops the test before its end. Once you have stopped a test procedure, you must restart it with a Run command from the Main Menu.

```
┌─────────────────────────────────┐
│         STOP TEST               │
│  Label    Comment               │
├─────────────────────────────────┤
│   ┌─────────┐   ┌──────────┐    │
│   │  :OK:   │   │  Cancel  │    │
│   └─────────┘   └──────────┘    │
└─────────────────────────────────┘
```

- Label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **OK** — Select this pushbutton to complete the Stop Test**...** creation.

- Cancel — Select this pushbutton to cancel the Stop Test**...**.

Gosub

Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. **Gosub...** opens the following dialog box, allowing you to create a test step that transfers program control to a subroutine located elsewhere in the test procedure. Program control transfers to a label you have assigned to the test step where program flow is to be transferred.

```
┌──────────────────────────────────────┐
│              GOSUB                     │
│  Edit   Label   Comment                │
│ ┌────────────────────────────────────┐│
│ │ Label:  │                          ││
│ │         └──────────────────────────┘│
│ │      ┌─────────┐   ┌──────────┐     │
│ │      │   OK    │   │  Cancel  │     │
│ │      └─────────┘   └──────────┘     │
└──────────────────────────────────────┘
```

- Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- *8* **Label:** — An edit box where you assign the name of the test procedure step where the subroutine starts.

- ■ **OK** — Select this pushbutton to complete the **Gosub...** creation.

- ■ **Cancel** — Select this pushbutton to cancel the **Gosub....**

Return

Select this menu item by pointing and clicking with the mouse, or by pressing the U keyboard key. **Return...** opens the following dialog box, allowing you to create a RETURN step from a subroutine. A RETURN step is required at the end of a subroutine to which program control was transferred with a GOSUB. A RETURN step returns program flow control to the step immediately following the last GOSUB.

```
┌──────────────────────────────────┐
│            RETURN                 │
│  Label   Comment                  │
├──────────────────────────────────┤
│     ┌────────┐    ┌────────┐      │
│     │  OK    │    │ Cancel │      │
│     └────────┘    └────────┘      │
└──────────────────────────────────┘
```

- ■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- ■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- ■ **OK** — Select this pushbutton to complete the **Return...** creation.

- ■ **Cancel** — Select this pushbutton to cancel the **Return....**

Goto

Select this menu item by pointing and clicking with the mouse, or by pressing the G keyboard key. **Goto...** opens the following dialog box, allowing you to create an unconditional program flow control transfer step to some specified place (Label) in the procedure.

```
              GOTO
  Edit   Label   Comment

  Label:  |                        |
          ┌──────────┐  ┌──────────┐
          │    OK    │  │  Cancel  │
          └──────────┘  └──────────┘
```

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

Label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

Label: — An edit box where you enter the label name of the test procedure step to where program control is to be transferred.

OK — Select this pushbutton to complete the **Goto...** creation.

Cancel — Select this pushbutton to cancel the **Goto....**

Operator Menu

The following Operator Menu appears whenever you select the **Operator** menu item from the Main Menu bar by pointing and clicking the mouse, or by pressing and holding the ALT keyboard key while pressing the O key. This menu allows you to create an instrument adjustment test procedure step, a test procedure step that displays selected data, and a test procedure step that displays a text or picture prompt for the operator.

```
┌──────────────────────────┐
│ Adjustment...            │
│ Display XYPlot...        │
│ Display Waveforms...     │
│ Display Data           ▶ │
│ Prompt                 ▶ │
└──────────────────────────┘
```

Adjustment

Select this menu item by pointing and clicking with the mouse, or by pressing the A keyboard key. **Adjustment...** opens the following dialog box, allowing you to enter the data required to establish an instrument ADJUSTMENT test procedure step. Any type of operation can be specified in an ADJUSTMENT loop. Typically, a value is measured from an instrument and returned to be compared to a required value, but any other IPG construct can be used in addition to, or in place of, a measured value. A **Pass/Fail** variable is provided so that you can determine if the ADJUSTMENT completed in or out of the specified range.

An example of an ADJUSTMENT step in the test procedure outline is as follows:

```
ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4 PASS/FAIL
gainpf
    Adjust R2022 for nominal in the display.
    MEASUREMENT DM5120 Reading gaincal
END-ADJUSTMENT
```

When IPG executes an ADJUSTMENT step, its action generates the following sequence of loop actions:

WHILE <expression> DO *<statement>* END

The first action of the sequence assigns *<expression>* to a temporary variable and sets it to = TRUE . While running, the loop continues until you select the **OK** pushbutton on the adjustment display. Selecting **OK** causes the temporary variable to change to FALSE ,terminating the ADJUSTMENT step.

<statement> consists of a separately created instrument MEASUREMENT step, which must be nested within the ADJUSTMENT construct.

```
┌──────────────────────────────────────────────────────────────┐
│                         ADJUSTMENT                             │
│  Edit  Label  Comment                                          │
│ ──────────────────────────────────────────────────────────── │
│  Lower Limit:        Nominal Value:        Upper Limit:        │
│  ┌──────────────┐    ┌──────────────┐      ┌──────────────┐    │
│  │I             │    │              │      │              │    │
│  └──────────────┘    └──────────────┘      └──────────────┘    │
│  Variable:    ┌────────────────────┐                           │
│               └────────────────────┘                           │
│  Pass/Fail:                                                    │
│  Message:     ┌────────────────────┐                           │
│               └────────────────────┘                      ┌─┐ │
│  ┌──────────────────────────────────────────────────────┐│▲│ │
│  │                                                      ││ │ │
│  │                                                      ││ │ │
│  │                                                      ││ │ │
│  │                                                      ││ │ │
│  │                                                      ││▼│ │
│  │◄│░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░░│►│       │
│            ┌──────────┐            ┌──────────┐               │
│            │    OK    │            │  Cancel  │               │
│            └──────────┘            └──────────┘               │
└──────────────────────────────────────────────────────────────┘
```

- **Edit** — Select this menu item by pointing and clicking with the mouse,
  or by pressing and holding the ALT keyboard key while pressing the E
  key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu
  description (previously given in this section) for the menu and informa-
  tion on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse,
  or by pressing and holding the ALT keyboard key while pressing the L
  key. **Label** allows you to add labels to this step. Refer to the Common
  Dialog Boxes description (given at the beginning of this section) for the
  menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the
  mouse, or by pressing and holding the ALT keyboard key while pressing
  the C key. **Comment** allows you to add comments to this step. Refer to
  the Common Dialog Boxes description (given at the beginning of this
  section) for the menu and information on its use.

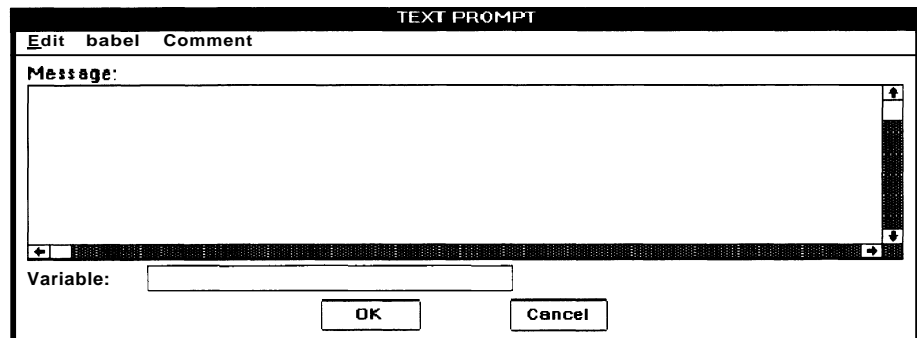IPG provides the following dialog box items for user interaction:

- **Lower Limit:** — An edit box where you enter the numeric term of the
  lower limit for the adjustment comparison.

- **Nominal Value:** — An edit box where you enter the numeric term of the
  nominal value of the adjustment. This is an optional entry.

- **Upper Limit:** — An edit box where you enter the numeric term of the
  upper limit for the comparison.

- **Variable:** — An edit box where you enter the name of the test variable to
  be compared.

- **Pass/Fail:** — An edit box where you enter the name of a variable to be
  assigned a Pass/Fail value of 1 (pass) or 0 (fail). (The Pass/Fail value is 1
  if the final adjustment places the measured value between the limits, or
  is 0 if the final measured value is outside the limits.)

- **Message:** — An edit box where you can enter a text message that will
  be displayed for the operator during the ADJUSTMENT step.

- **OK** — Select this pushbutton to complete the **Adjustment...** creation.

- **Cancel** — Select this pushbutton to cancel the **Adjustment...**

When IPG runs an ADJUSTMENT step it creates a display like that shown in the following illustration.

This display includes representative markers (triangles and diamonds) and numeric values for the **Low** limit, **High** limit, **Nominal:** value, and **Actual:** value of the ADJUSTMENT step. It also provides an operator prompt message for making the adjustment. If the instruments are on line and fully functional, or the procedure is run in the Emulate mode, each time you make an adjustment (or send an entry with a Read Emulate box), the representative marker (diamond) and **Actual:** value for the point being measured will change on the display. This adjust, measure, compare, and change display sequence continues until you select the **OK** pushbutton on the display.

NOTE

The first time the adjustment loop appears, there is no **Actual:** value, thus IPG assumes a Low *Limit* for placing the diamond marker on the display.

Display XYPlot

Select this item by pointing and clicking with the mouse or by pressing the X keyboard key. **Display XYPlot** opens the following dialog box, allowing you to select array pairs to be displayed. With this step you can display up to ten different array pairs on the same graphical display.
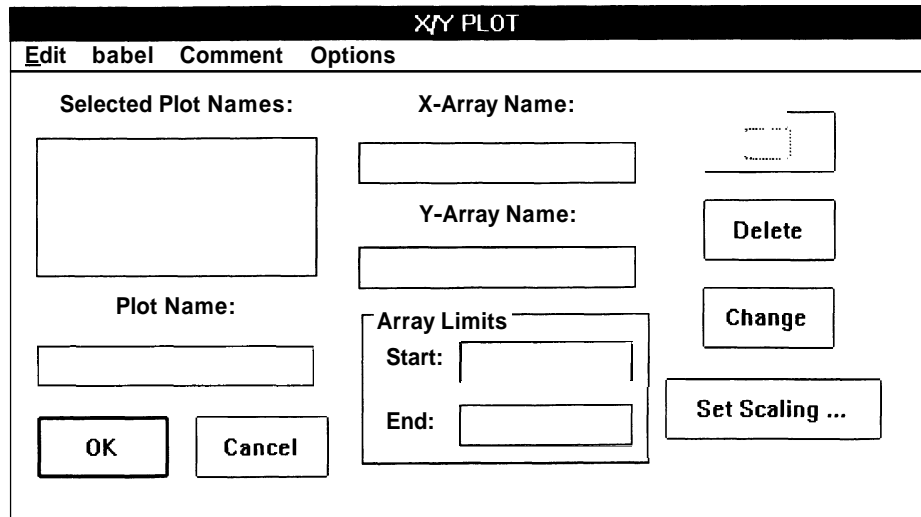
```
┌─────────────────────────────────────────────────────────┐
│                         X/Y PLOT                          │
│  Edit   babel   Comment   Options                         │
│ ───────────────────────────────────────────────────────  │
│   Selected Plot Names:          X-Array Name:             │
│   ┌──────────────────┐    ┌──────────────────┐   ┌─────┐  │
│   │                  │    │                  │   │     │  │
│   │                  │    └──────────────────┘   └─────┘  │
│   │                  │          Y-Array Name:             │
│   │                  │    ┌──────────────────┐ ┌────────┐ │
│   └──────────────────┘    └──────────────────┘ │ Delete │ │
│        Plot Name:        ┌─Array Limits─────┐   └────────┘ │
│   ┌──────────────────┐   │ Start: ┌───────┐ │  ┌────────┐  │
│   │                  │   │        └───────┘ │  │ Change │  │
│   └──────────────────┘   │ End:   ┌───────┐ │  └────────┘  │
│   ┌──────┐  ┌────────┐   │        └───────┘ │ ┌──────────┐ │
│   │  OK  │  │ Cancel │   └──────────────────┘ │Set Scaling..│
│   └──────┘  └────────┘                        └──────────┘ │
└─────────────────────────────────────────────────────────┘
```

■ **Options** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the O key. **Options** opens the following Options menu, allowing you to select graphics display enhancements that change the default display when the step is run.

```
┌────────────────────────┐
│ Options                │
│ Grid                   │
│ ──────────────────     │
│ Colors and Styles...   │
│ Labels...              │
└────────────────────────┘
```
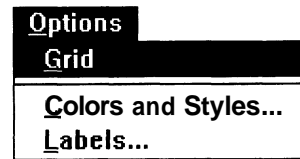
■ **Grid** — adds vertical and horizontal grids to the graphics display at each major vertical and horizontal scale mark. See page 4-111 for more information.

● **Colors and Styles** — This menu it allows you to select graphics display colors and line styles. See page 4-112 for more information.

● **Labels** — This menu item allows to change the graphics display title and the names of the X and Y Axes. See page 4-114 for more information.

■ **Selected Plot Names:** — This list box provides a list of the plot names that have been selected for display. To change or delete a plot name or its associated arrays, you double click on the plot name in this list box, make your changes if needed, and then click on the appropriate pushbutton to the extreme right of this list box.

■ **Plot Name** — An edit box where you enter the unique name of the array pair to be displayed. This Plot name can be any alphanumeric characters that you wish to enter. This name is an identifier and is used in the default tittle and in the **Colors and Styles** to identify a specific array pair.

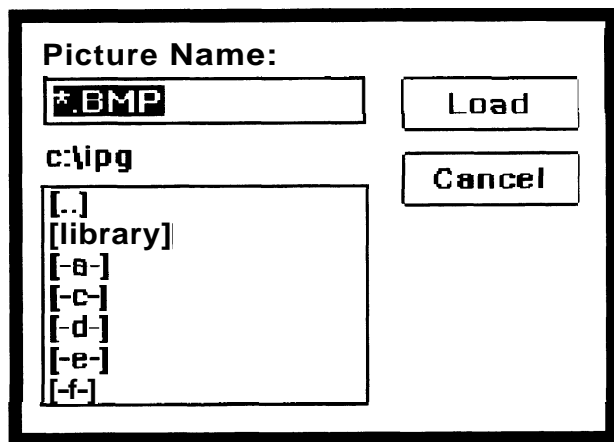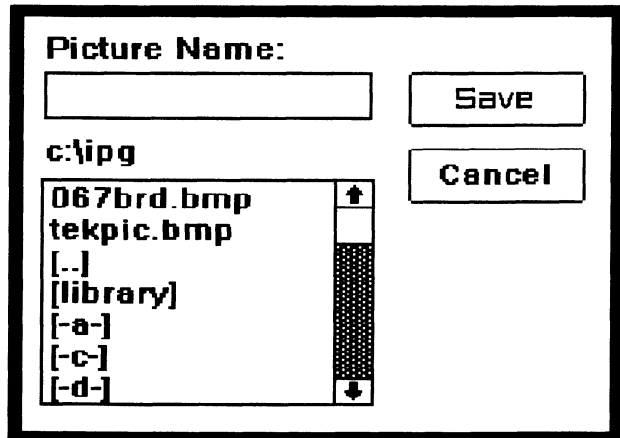■ OK — Select this pushbutton to complete the **Display XYPlot** creation.

- Cancel — Select this pushbutton to cancel the Display **XYPlot.**

- X-Array Name: — An edit box where you enter the numeric array values that are the points for the X axis. The array name is given as a whole array reference, i.e., a&[], with no specific subscript.

- Y-Array Name: — An edit box where you enter the numeric array values that are the points for the Y axis. The array name is given as a whole array reference, i.e., b&[], with no specific subscript.

- Array — This group gives the starting and ending array subscripts for the Display **XYPlot** to use is determining the points to plot.

  - Start: — An edit box where you enter the numeric expression that is index into the arrays of the first point to be plotted. This is an optional field and if not given or out of bounds of either array, the default is zero (the first point of the array).

  - End — An edit box where you enter the numeric expression that is index of the last point to be plotted. This is an optional field and if not given or out of bounds of either array, the default is the last point of the smaller array.

- Add — Select this pushbutton to place the plot name listed in the Plot Name edit box into the Selected Plot Names list.

- Delete — Select this pushbutton to delete the plot name highlighted in the Selected Plot Names list box.

- Change — Select this pushbutton to complete a change made to the plot name highlighted in the Selected Plot Names list box.

- Set Scaling — A pushbutton that opens the following dialog box, allowing you to select the axes' limits explicitly or let the display select the scaling.

- **AutoScale** Axes — Select this check box to have the graphics display automatically calculate the axes scaling so that all graphs displayed are fully visible.

- Horizontal Axis — The group name for the X axis scaling value edit boxes.

    - Max **X:** — An edit box where you enter the numeric expression that is the maximum X value that will be displayed without using scrolling.

    - Min **X:** — An edit box where you enter the numeric expression that is the minimum X value that will be displayed without using scrolling.

- Vertical Axis — The group name for the Y axis scaling value edit boxes.

    - Max Y: — An edit box where you enter the numeric expression that is the maximum Y value that will be displayed without using scrolling.

- OK — Select this pushbutton to complete the Set Scaling specification.

- Cancel — Select this pushbutton to cancel the Set Scaling.

Display Waveforms

Select this item by pointing and clicking with the mouse or by pressing the V keyboard key. Display Waveforms opens the following dialog box, allowing you to select waveform variables to be displayed. With this step you can display up to ten different waveforms on the same graphical display.
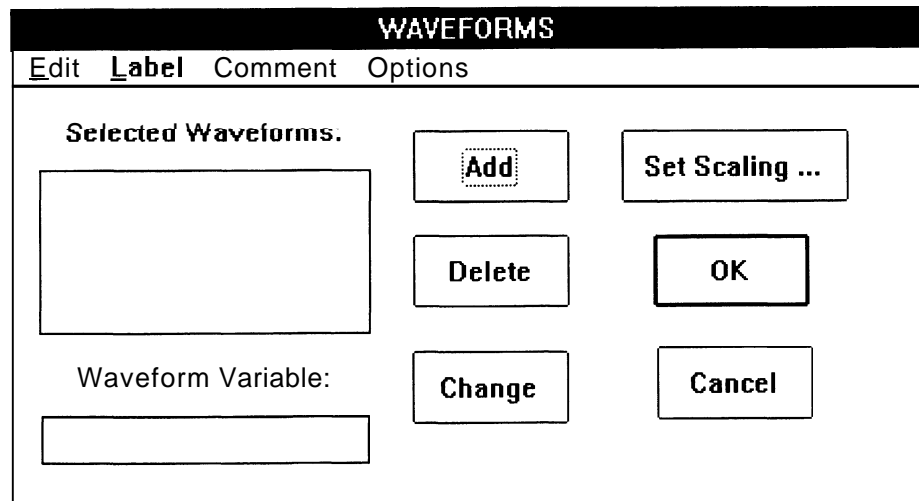
- Options — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the O key. Options opens the following Options menu allowing you to select waveform display enhancements that change the default display when the step is run.

```
Options
Grid

Colors and Styles...
Labels...
```
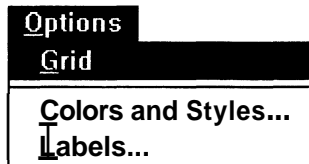
- **Grid** — adds vertical and horizontal grids to the waveform display at each major vertical and horizontal scale mark. See page 4-111 for more information.

- **Colors and Styles** — This menu it allows you to select waveform display colors and line styles. See page 4-112 for more information.

- **Labels** — This menu item allows to change the waveform display title and the names of the X and Y Axes. See page 4-114 for more information.

- **Selected Waveforms:** — This list box provides a list of the waveform variables that have been selected for display. To change or delete a waveform variable, you double click on the variable name in this list box and then click on the appropriate pushbutton to the right of this list box.

- **Waveform Variable** — An edit box where you enter the variable name of the waveform to be displayed. This variable name must be an initialized waveform variable.

- **Add** — Select this pushbutton to place the waveform variable listed in the **Waveform Variable** edit box into the **Selected Waveforms** list.

- **Delete** — Select this pushbutton to delete the waveform variable highlighted in the **Selected Waveforms** list box.

- **Change** — Select this pushbutton to complete a change made to the waveform variable highlighted in the **Selected Waveforms** list box.

- **Set Scaling** — A pushbutton that opens the following dialog box, allowing you to select the axes' limits explicitly or let the display select the scaling.

```
AXIS SCALING

Edit

                          ☐ AutoScale Axes:

┌ Horizontal Axis ──────────┐   ┌ Vertical Axis ──────────┐
│                           │   │                         │
│  Max X:  [            ]    │   │  Max Y:  [          ]    │
│                           │   │                         │
│  Min X:  [            ]    │   │  Min Y:  [          ]    │
└───────────────────────────┘   └─────────────────────────┘

              [    OK    ]         [  Cancel  ]
```

- **AutoScale Axes** — Select this check box to have the waveform display automatically calculate the axes scaling so that all waveforms displayed are fully visible.

- **Horizontal Axis** — The group name for the X axis scaling value edit boxes.

  - **Max X:** — An edit box where you enter the numeric expression that is the maximum X value that will be displayed without using scrolling.

  - **Min X:** — An edit box where you enter the numeric expression that is the minimum X value that will be displayed without using scrolling.

- **Vertical Axis** — The group name for the Y axis scaling value edit boxes.

  - **Max Y:** — An edit box where you enter the numeric expression that is the maximum Y value that will be displayed without using scrolling.

  - **Min** Y: — An edit box where you enter the numeric expression that is the minimum Y value that will be displayed without using scrolling.

- **OK** — Select this pushbutton to complete the **Set Scaling** specification.

  - **Cancel** — Select this pushbutton to cancel the **Set Scaling.**

- **OK** — Select this pushbutton to complete the **Display Waveforms** creation.

- **Cancel** — Select this pushbutton to cancel the **Display Waveforms.**

Display Data

Select this menu item by pointing and clicking with the mouse, or by pressing the D keyboard key. **Display Data** shows the following menu list, allowing you to select an item for display, and to add a user-defined caption or message to that display.

Wait...
Continue...
Remove

■ **Wait...** — Select this menu item by pointing and clicking with the mouse, or by pressing the W keyboard key. **Wait...** opens the following dialog box, allowing you to create a test procedure step that will display a message box containing a specified result (expression) and a message to the operator. **Wait...** halts the test procedure until you point and click the mouse on either the **OK** or the **Abort** pushbuttons that appear in the message box. **OK** will allow the test procedure to continue, **Abort** will abort the test procedure.

```
┌──────────────────────────────────────────────────────┐
│                  DISPLAY DATA WAIT                     │
├──────────────────────────────────────────────────────┤
│ Edit   Label   Comment                                 │
│ Caption:                                               │
│ ┌────────────────────────────────────────────────┬─┐ │
│ │                                                  │▲│ │
│ │                                                  ├─┤ │
│ │                                                  │▓│ │
│ │                                                  │▓│ │
│ │                                                  │▓│ │
│ │                                                  ├─┤ │
│ │                                                  │▼│ │
│ └────────────────────────────────────────────────┴─┘ │
│ Expression:                                            │
│ ┌────────────────────────────────────────────────┐   │
│ │                                                  │   │
│ └────────────────────────────────────────────────┘   │
│      ┌──────────────┐      ┌──────────────┐           │
│      │      OK       │      │    Cancel     │          │
│      └──────────────┘      └──────────────┘           │
└──────────────────────────────────────────────────────┘
```

■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **Caption:** — An edit box where you enter the comment text that you want displayed to the operator.

■ **Expression:** — An edit box where you enter the expression that you want displayed. (For example, if you enter a variable that you have assigned to a calculation step, the value of that variable at the time of the display step would be shown in the message box for the operator.)

- OK — Select this pushbutton to complete the Wait**...** creation.

- Cancel — You can select this pushbutton to cancel the Wait**....**

■ **Continue...** — Select this menu item by pointing and clicking with the mouse, or by pressing the C keyboard key. Continue**...** opens the following dialog box, allowing you to create a test procedure step that will display a message box containing a specified result (expression) and a message to the operator. The test procedure will continue to run while the dialog box is displayed, and the specified expression will be continuously updated, as necessary. (You insert a Remove command into the test procedure to remove the dialog box display.)

The first time a DISPLAY DATA step of type CONTINUE is executed, the data in the step is processed and the resulting information is shown in the Display Data execution dialog box. Subsequent DISPLAY DATA CONTINUE steps will update the information shown in the Display Data dialog box. Only one DISPLAY DATA CONTINUE step is allowed, as it will be updated with any new data. You can use a DISPLAY DATA WAIT step with the CONTINUE step; the Wait dialog box will cover the Continue dialog box.

```
┌─────────────────────────────────────────────────────┐
│              DISPLAY DATA CONTINUE                    │
│ Edit   Label   Comment                                │
│ Caption:                                              │
│ ┌───────────────────────────────────────────────┬─┐  │
│ │                                                 │▲│  │
│ │                                                 ├─┤  │
│ │                                                 │▓│  │
│ │                                                 │▓│  │
│ │                                                 ├─┤  │
│ │                                                 │▼│  │
│ └───────────────────────────────────────────────┴─┘  │
│ Expression:                                           │
│ ┌──────────────────────────────────────────────────┐ │
│ ││                                                   │ │
│ └──────────────────────────────────────────────────┘ │
│        ┌──────────┐        ┌──────────┐               │
│        │    OK    │        │  Cancel  │               │
│        └──────────┘        └──────────┘               │
└─────────────────────────────────────────────────────┘
```

- Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- Label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- Caption: — An edit box where you enter the comment text that you want displayed to the operator.

- Expression: — An edit box where you enter the expression that you want displayed. For example, if you enter a variable that you have assigned to a calculation step, the value of that variable is constantly updated and shown in the message box for the operator. The exception to this is a waveform variable. A waveform variable can not be displayed with Continue**...**, only with Wait**....**

- **OK** — Select this pushbutton to complete the Continue**...** creation.

- Cancel — Select this pushbutton to cancel the Continue**....**

- Remove — Select this menu item by pointing and clicking with the mouse, or by pressing the R keyboard key. Remove opens the following dialog box, allowing you to create a test procedure step that will remove a Continue**...** message box from the display.
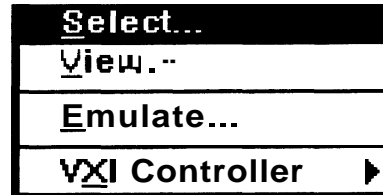

- Label — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the *Common Dialog Boxes* description (given at the beginning of this section) for the menu and information on its use.

- Comment — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the *Common Dialog* Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **OK** — Select this pushbutton to complete the Remove creation.

- Cancel — Select this pushbutton to cancel the Remove.

<u>P</u>rompt

Select this menu item by pointing and clicking with the mouse, or by pressing the P keyboard key. **Prompt...** shows the following menu list, allowing you to select the type of prompt display created by this test step. The selected prompt will be displayed to the operator.

```
Text...
Picture...
```

■ **<u>T</u>ext...** — Select this menu item by pointing and clicking with the mouse, or by pressing the T keyboard key, **Text...** opens the following dialog box, allowing you to select text as the **Prompt** type.

```
                          TEXT PROMPT
Edit   babel   Comment

Message:
┌──────────────────────────────────────────────────────┐▲
│                                                        │
│                                                        │
│                                                        │
│                                                        │
│                                                        │▼
└◄──────────────────────────────────────────────────────►┘

Variable:   [                                    ]

              [   OK   ]        [  Cancel  ]
```

- ■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit* Menu description (previously given in this section) for the menu and information on its use.

- ■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common *Dialog* Boxes description (given at the beginning of this section) for the menu and information on its use.

- ■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common *Dialog* Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **Message:** — An edit box where you enter a message for display to the operator when the test procedure is run. If the message exceeds 75 characters on the outline display, the last three characters (of the 75) and all remaining characters will be replaced with an ellipsis (**. . .**). When this occurs on the outline display, the only way you can read the entire message is to double-click on the outline step to open the dialog box with the message in it, or print the procedure using the **Full** setting.

■ **Variable:** — An edit box where you enter the name of a variable for storing an operator response. Entering this variable is optional. If you enter a variable name, you will have to enter a response in the **Text Prompt** dialog box when you execute the test procedure. If **Variable:** is a number the response must be a number, if a string, the response must be a string. If you use a string variable, you can enter a multiple line response and then press and hold the SHIFT key while pressing the ENTER key to terminate the response.

OK — Select this pushbutton to complete the **Text...** creation.

Cancel — Select this pushbutton to cancel the **Text....**

Picture... — Select this menu item by pointing and clicking with the mouse, or by pressing the I keyboard key. **Picture...** opens the following dialog box, allowing you to select a picture as the **Prompt** type.

■ **File** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the F key. **File** opens the following File Menu, allowing you to load a picture file, save a picture file, or exit picture prompt.
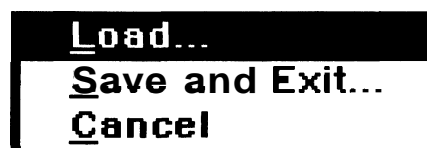
■ **Load...** — Select this menu item by pointing and clicking with the mouse, or by pressing the L keyboard key. **Load...** opens the following dialog box, allowing you to select an existing picture file (with a .BMP extension) to be loaded. This picture must be a bit-mapped picture file that is compatible for reading into a Windows environment. (You can use a bit-mapped image from the Windows clipboard with P ICTURE PROMPT. After copying the image to the clipboard, initialize IPG and select **Operator** from the Main Menu bar, then **Prompt...**, then **Picture....** Select **Edit** from the **Picture Prompt** dialog box. Select **Paste** and the contents of the Windows clipboard will become visible in the dialog box. Select **File,** then **Save and Exit....** Enter a name and a .BMP file will be created for the image.

```
┌─────────────────────────────────────────────┐
│  Picture Name:                                │
│  ┌─────────────────────┐   ┌──────────────┐  │
│  │ *.BMP               │   │    Load      │  │
│  └─────────────────────┘   └──────────────┘  │
│  c:\ipg                    ┌──────────────┐  │
│  ┌─────────────────────┐   │   Cancel     │  │
│  │ [..]                │   └──────────────┘  │
│  │ [library]           │                     │
│  │ [-a-]               │                     │
│  │ [-c-]               │                     │
│  │ [-d-]               │                     │
│  │ [-e-]               │                     │
│  │ [-f-]               │                     │
│  └─────────────────────┘                     │
└─────────────────────────────────────────────┘
```

IPG provides the following dialog box items for user interaction:

■ **Picture Name:** — An edit box where you enter the name of the picture file you want to load.

The current drive and directory pathname above a list box containing file names you can select, or disk drives and directories that you can select to display other file names. To load a file, enter its name in the **Picture Name:** edit box and select the **Load** pushbutton, or point and click with the mouse on the file name in the list box, then select the **Load** pushbutton.

■ **Load** — Select this pushbutton to load the picture file whose name is specified in **Picture Name:.**

■ **Cancel** — Select this pushbutton to cancel the **Load....**

■ **Save and Exit...** — Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. If the picture that is currently loaded has not previously been named, **Save and Exit...** will open the following dialog box, allowing you to save the current picture file and exit the Operator Menu. If the picture is already named, **Save and Exit...** just exits the Operator Menu.

```
Picture Name:
[              ]        [ Save ]

c:\ipg                 [ Cancel ]
┌─────────────┬─┐
│ 067brd.bmp  │↑│
│ tekpic.bmp  ├─┤
│ [..]        │▓│
│ [library]   │▓│
│ [-a-]       │▓│
│ [-c-]       │▓│
│ [-d-]       │↓│
└─────────────┴─┘
```

■ **Cancel** — Select this menu item by pointing and clicking with the mouse, or by pressing the C keyboard key to cancel the **Prompt.**

Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** causes a one item menu to appear, containing **Paste Picture.** Select this item by pointing and clicking with the mouse, or by pressing the P keyboard key. **Paste Picture** allows you to transfer a picture from the clipboard and convert it to a bit-mapped image (.BMP file) for use in IPG. You can use any bit-mapped picture that can be copied to the clipboard.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. **Label** allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. **Comment** allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

Link Menu

The following Link Menu appears when you select the **Link** menu item from the Main Menu bar by pointing and clicking the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. This menu allows you to access the Excel Menu from which you can create Dynamic Data Exchange steps between TekTMS and Microsoft Excel

```
┌─────────┐┌──────────┐
│ Excel   ││ Read...  │
│         ││ Send...  │
│         ││ Close... │
└─────────┘└──────────┘
```
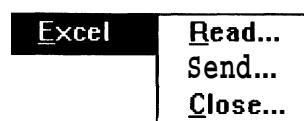
Send

Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. **Send...** opens the following dialog box, allowing you to enter the data required to establish a Dynamic Data Exchange test procedure step. This step provides the ability to transfer data to a specific Excel spreadsheet cell location on an Excel spreadsheet designated in the dialog box. Typically one, or more equipment variable values or test result values are obtained during preceding test steps. These values may be stored on Excel spreadsheets for subsequent manipulation or reuse.

- ■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- ■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the, menu and information on its use.

- ■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **File Name:** — This contains the Excel spreadsheet name in the form of a string expression. If this spreadsheet already exists then the step will instruct Excel to open it. If this spreadsheet does not exist then the step will instruct Excel to create a new (empty) spreadsheet and name it using this name. Note that all Excel spreadsheet names end with the a file extension of "XLS". This extension should not be included in this dialog box item.

- **Cell Reference:** — This contains the Excel data cell location in the form of a string expression. The string may identify a specific cell in the format expected by Excel. For example if the data is to be positioned in row two and column three then this string value would be "C2".

- This particular cell location on the Excel spreadsheet could also be given an English like name such as "Volts" by customizing the spreadsheet in Excel This cell name could then be used in the string entered in this dialog box item.

- **Macro File Name** — This contains an Excel macro file name in the form of a string expression. The macro file must be created before step execution.

- **MacroName** — This contains an Excel macro name in the form of a string expression. The Excel macro must be created and named on the macro sheet before step execution.

- **Data Expression** — This contains the TekTMS string or arithmetic expression from which the test program expects the program to get the data to be sent to the Excel cell location.

- **Macro** — This checkbox indicates that an Excel macro is to be executed. If this checkbox is checked then the step will be presented with **Macro File Name** and **MacroName** items. Otherwise the step will be presented with **File Name** and **Cell Reference** items.

  When running a macro, you can stop the execution of TekTMS/IPG at any time by entering Control "C". You can then go to Excel and stop the macro if needed by pressing ESC.

```
╔═══════════════════════════════════════════════╗
║              SEND TO EXCEL                      ║
╟───────────────────────────────────────────────╢
║  Edit   Label   Comment                         ║
║  ─────────────────────────────────────────────  ║
║                                                 ║
║   Macro File Name:              ☒ Macro         ║
║   ┌─────────────────────────┐                   ║
║   │ |                       │                   ║
║   └─────────────────────────┘   ┌──────────┐    ║
║                                 │    OK    │    ║
║   MacroName:                    └──────────┘    ║
║   ┌─────────────────────────┐                   ║
║   │                         │                   ║
║   └─────────────────────────┘   ┌──────────┐    ║
║                                 │  Cancel  │    ║
║   Data Value:                   └──────────┘    ║
║   ┌─────────────────────────┐                   ║
║   │                         │                   ║
║   └─────────────────────────┘                   ║
╚═══════════════════════════════════════════════╝
```

- OK — Select this pushbutton to complete the **Send...** creation

  Cancel — Select this pushbutton to cancel the **Send....**

Read

Select this menu item by pointing and clicking with the mouse, or by pressing the R keyboard key. **Read...** opens the following dialog box, allowing you to enter the data required to establish a Dynamic Data Exchange test procedure step. This step provides the ability to transfer data from a specific Excel spreadsheet cell location on the Excel spreadsheet designated in the dialog box. Typically one, or more equipment variable values or test result values are obtained during preceding test steps. These values may be obtained from the Excel spreadsheets for subsequent manipulation or reuse in the step.

```
╔═══════════════════════════════════════════════╗
║             READ FROM EXCEL                     ║
╟───────────────────────────────────────────────╢
║  Edit   Label   Comment                         ║
║  ─────────────────────────────────────────────  ║
║                                                 ║
║   File Name:                                    ║
║   ┌─────────────────────────┐                   ║
║   │ |                       │                   ║
║   └─────────────────────────┘                   ║
║                                 ┌──────────┐    ║
║   Cell Reference:               │    OK    │    ║
║   ┌─────────────────────────┐   └──────────┘    ║
║   │                         │                   ║
║   └─────────────────────────┘                   ║
║                                 ┌──────────┐    ║
║   Data Value:                   │  Cancel  │    ║
║   ┌─────────────────────────┐   └──────────┘    ║
║   │                         │                   ║
║   └─────────────────────────┘                   ║
╚═══════════════════════════════════════════════╝
```

- **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

- **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

- **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **File Name:** — This contains the Excel spreadsheet name in the form of a string expression. This spreadsheet must exists in order for the step to instruct Excel to open it. If this spreadsheet does not exist then the step will fail.

- **Cell Reference:** — This contains the Excel data cell location in the form of a string expression. The string may identify a specific cell in the format expected by Excel. For example if the data is to be positioned in row two and column three then this string value would be "A3".

- This particular cell location on the Excel spreadsheet could also be given an English like name such as "Volts" by customizing the spreadsheet in Excel This cell name could then be used in the string entered in this dialog box item.

- **Data Expression** — This contains the TekTMS string or arithmetic expression into which the test program expects the step to put the data read from the Excel cell location.

- **OK** — Select this pushbutton to complete the **Read...** creation

- **Cancel** — Select this pushbutton to cancel the **Read....**

Close

Select this menu item by pointing and clicking with the mouse, or by pressing the **C** keyboard key. **Close...** opens the following dialog box, allowing you to enter the data required to establish a Dynamic Data Exchange test procedure step. This step provides the ability to close the Excel spreadsheet designated in the dialog box.

```
┌─────────────────────────────────────────────────────────┐
│                 CLOSE EXCEL DOCUMENT                      │
├─────────────────────────────────────────────────────────┤
│ Edit   Label   Comment                                    │
├─────────────────────────────────────────────────────────┤
│ File Name:                          ⊠ Save Document       │
│ ┌───────────────────────────────┐                        │
│ │                               │   ┌──────────┐          │
│ └───────────────────────────────┘   │    OK    │          │
│ Save As:                            └──────────┘          │
│ ┌───────────────────────────────┐   ┌──────────┐          │
│ │                               │   │  Cancel  │          │
│ └───────────────────────────────┘   └──────────┘          │
└─────────────────────────────────────────────────────────┘
```

■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the Edit Menu description (previously given in this section) for the menu and information on its use.

■ **Label** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the L key. Label allows you to add labels to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

■ **Comment** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the C key. Comment allows you to add comments to this step. Refer to the Common Dialog Boxes description (given at the beginning of this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **File Name:** — This contains the Excel spreadsheet name in the form of a string expression. This spreadsheet must exists in order for the step to instruct Excel to close it. If this spreadsheet does not exist then the step will fail.

■ **Saved As:** — This contains the Excel spreadsheet name in the form of a string expression. This is the file name to be used by Excel to save this particular spreadsheet in the form of a disk data file.

■ **Save Document** — This is a checkbox that, when checked, instructs this step to save the spreadsheet as a disk file.

■ **OK** — Select this pushbutton to complete the **Read...** creation

■ **Cancel** — Select this pushbutton to cancel the **Read....**

Instruments Menu

The following Instruments Menu appears whenever you select the **Instruments** command from the Main Menu bar by pointing and clicking with the mouse or by pressing and holding the ALT keyboard key while pressing the I key. The Instruments Menu opens the following menu list, allowing you to select instrument drivers from a list of available drivers. These drivers contain instrument front panel views used by IPG for configuring instruments and creating test procedure steps.

```
 Select...
 View. ··
 Emulate...
 VXI Controller    ▶
```

Select

Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. **Select...** opens the following dialog box, allowing you to select instruments for a test procedure, edit the current selection list, or edit parameters of instruments in the selection list.

```
                    INSTRUMENT SELECT
  TMS Name          Driver              Address


  Drivers:          Port:     ┌Address:──┐   TMS Name:
  ┌──────────────┐  ┌──────┐  │ Primary: │   ┌──────────────┐
  └──────────────┘  │      │  │ ┌──────┐ │   └──────────────┘
  c:\ipg            │      │  │ └──────┘ │
  ┌───────────┬─┐   │      │  │ Secondary:│
  │[..]       │▲│   │      │  │ ┌──────┐ │   ┌──────────┐
  │[library]  │ │   │      │  │ └──────┘ │   │  Delete  │
  │[-a-]      │ │   └──────┘  └──────────┘   └──────────┘
  │[-c-]      │ │   ┌──────┐    ┌──────┐     ┌──────────┐
  │[-d-]      │ │   │  OK  │    │Cancel│     │  Change  │
  │[-e-]      │▼│   └──────┘    └──────┘     └──────────┘
  └───────────┴─┘
```
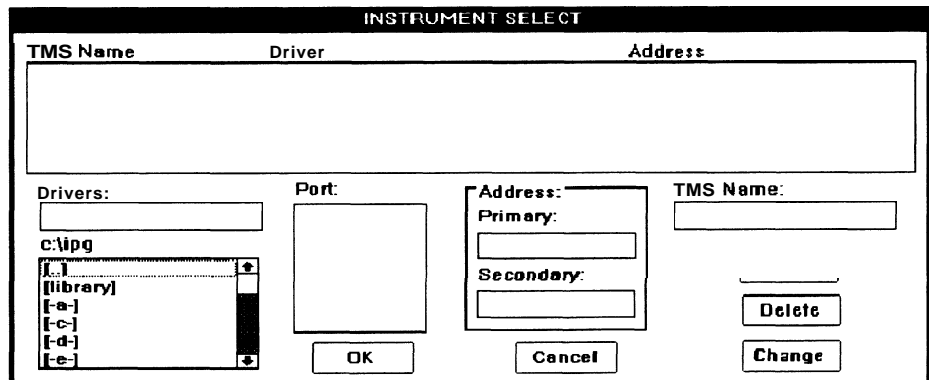
IPG provides the following dialog box items for user interaction:

■   A list box identified by the column headers: **TMS Name, Drivers, Port,** and **Address.** This list box displays the instruments that you have selected for the test procedure.

■   **Drivers:** — An edit box where the instrument driver file name (with an .ISD extension) appears when you select it from the available instruments list box. To select a driver file, point and double-click the mouse on the file name in the list box (or enter the name and press the RETURN keyboard key). This will cause the file name to appear in the **Drivers:** edit box, and an entry to appear in the **Port:** edit box.

The current drive and directory path and a list box below that show the available instrument driver files you can select. The list box also contains disk drives and/or directories where other files can be found.

■ **Port:** — An edit box in which appears the communications path for the instrument you have selected. (For example, entries in this box may include GPIBO, GPIB1, VXI, etc.)

Address: — An edit box where you enter the address for the selected instrument, a Device Name for a VXI instrument, etc. When you select a GPIB instrument, you will need to enter the **Primary:** and **Secondary:** addresses. When you select a VXI instrument, you will need to enter a **Device Name:.** The IPG will provide the correct entry box for the instrument you have chosen.

If the ISD file has VXIINTERNAL or MXI as the bustype and the controller type is Tektronix VXI, address selection consists of a combination box containing a list of instruments found by the VXI resource manager. You may either select one of the instruments from the list or you may type in a name of your own. Supplying a name of your own is useful if you are developing tests off line. If the controller is CDS VXI then the address selection consists of a combination box for the ULA (Unique Logical Address). The combination box contains a list of all the instruments found by the VXI resource manager. This list has the ULA and the instrument slot number. You may either select an instrument from the list, or enter a ULA. The address edit box must contain a number for the selected instruments ULA. You do not have to add the slot number when specifying an instrument not in the list.

If the ISD file has GPIB or VX5520 as the bustype, address selection consists of two edit boxes. One edit box is for the primary GPIB address and the other is for the secondary GPIB address. You must give a primary address, but you may leave the secondary address edit box empty if you are not using secondary GPIB addressing.

If the ISD file has CDSBUS as the bustype, address selection consists of two edit boxes. One edit box is for the cage number and one is for the slot number. You must enter values in both edit boxes to specify a particular instrument.

If the ISD file has RS232 as the bustype, no address selection is made.

NOTE

Some *VXI* test systems have controllers or resource managers that assign a **Device Name:** to an instrument at power-up, and make provisions for that name to be changed on command. IPG users should be aware of the Device Name: assigned to an instrument in the particular *VXI* system being used.

If a *VXI* system is configured by a *Tektronix VX5520* Slot 0 Resource Manager; it assigns a **Device Name:** of *DEVxx,* where *xx* is a two-digit numeric value sequentially assigned by the *VX5520.* The

VX5520 also provides you with the capability to query for the name assigned by the system, or to change that name to a specific name, such as *"VX5260"*.

If a *VXI* system is configured by a *Tektronix VX453x* (or *VX553x)* System Controller, it assigns a **Device Name:** of *V57DEVx,* where x is a numeric value (may be one or more digits) assigned by the *VX453x* (or *VX553x).* The *VX453x* (or *VX553x)* also have provisions for querying for the name and changing it.

When you use *VXI* systems in a test system, it is possible for the **Device Name:** of any particular *VXI* instrument to change during each system power-up. For example, if you change the instrument combination in the system, or an instrument location in a mainframe, the configuration that occurs on power-up may change the **Device Name:** of some or all the instruments. If this name change occurs, you would need to verify those test procedure steps using the *VXI* system contained the correct **Device Name:.**

- ■ **TMS Name:** — An edit box where you enter a name (such as *DMM1*) that is to be assigned to the selected instrument for the current test procedure step. This wave must be unique.

- ■ **Add** — Select this pushbutton to add a highlighted instrument identified in the **Drivers:, Port:, Address:,** and **TMS Name:** edit boxes to the selected instruments list box. As you **Add** instruments, they will appear in the selected instruments list box. You can **Add** multiple instruments before selecting the **OK** pushbutton to complete the command.

- ■ **Delete** — Select this pushbutton, then select the **OK** pushbutton, to delete a highlighted instrument from the selected instruments list box. When you **Delete** an instrument, it is no longer available to the test procedure.

- ■ **Change** — Select this pushbutton to implement changes made to the **Port:, Address:,** or **TMS Name:** parameters of a highlighted instrument driver.

- ■ **OK** — Select this pushbutton to complete the **Select....** When you are adding instruments to the selected instruments list box, you do not need to select the **OK** pushbutton until you have selected all the instruments desired.

- ■ **Cancel** — Select this pushbutton to cancel the **Select....**

View

View displays a list of selected instrument names. Select the instrument you wish to see from the list and the front panel for that instrument will appear.

Emulate

Select this menu item by pointing and clicking with the mouse, or by pressing the E keyboard key. **Emulate...** opens the following dialog box, allowing you to select an interactive operational mode where you emulate the test instrumentation when a test procedure is run. This allows you to run, test, and debug a test procedure without connecting actual test instruments. In this mode, you must input simulated instrument responses through a **Read Emulation** dialog box or from a file containing the required input entries. (Each Instrument response from a file is limited to 510 characters, or is delimited by a CRLF.) Use emulation in conjunction with the **Trace** function (from the **Debug** Menu) to monitor the communications between the test procedure and the instrument.

The entries in this dialog box determine whether the Emulate mode is enabled or disabled, and if enabled, whether you input simulated instrument responses through a **Read Emulation** dialog box (see Section *4,* Running a Test Procedure), or whether the responses are input automatically from a file.

```
┌─────────────────────────────────────┐
│          EMULATE OPTIONS            │
├─────────────────────────────────────┤
│  ☐ ┊Emulation on┊                   │
│  ☐ Read from file                   │
│                                     │
│  File:  ┌───────────────────────┐   │
│         └───────────────────────┘   │
│    ┌──────────┐   ┌──────────┐      │
│    │   OK     │   │  Cancel  │      │
│    └──────────┘   └──────────┘      │
└─────────────────────────────────────┘
```
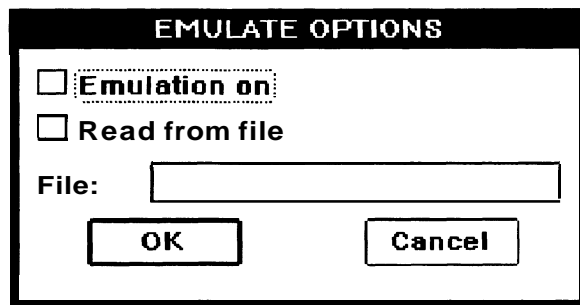
IPG provides the following dialog box items for user interaction:

- **Emulation On** — Select this check box to enable the Emulation; when this box is not selected, Emulation is disabled. If you select this check box, then select the **OK** pushbutton, you will need to supply the input will be through a **Read Emulation** dialog box.

- **Read from file** — Select this check box to enable the Read from File Emulate mode. When you have selected **Read from file,** the **OK** pushbutton is displayed in gray until an entry is made in the **File:** edit box. After you enter a pathname in the **File:** edit box, then the **OK** pushbutton will return to an active state (be displayed in black). You then select **OK,** and IPG will expect inputs from the file you have entered.

- **File:** — An edit box where you enter the file path name. This edit box automatically scrolls horizontally to accept up to 128 characters. This file that you enter must be an ASCII file using CRLF line termination. IPG automatically stops reading a response line at 510 characters, or at a CRLF. If you use MS Windows Write to create the file, you must select the file type *ASCII* Only.

- **OK** — Select this pushbutton to complete the **Emulate** action.

■ Cancel — Select this pushbutton to cancel the Emulate. When you select Cancel, the Emulate mode reverts to its previous status before the dialog box appeared.

Instruments Controller Menu
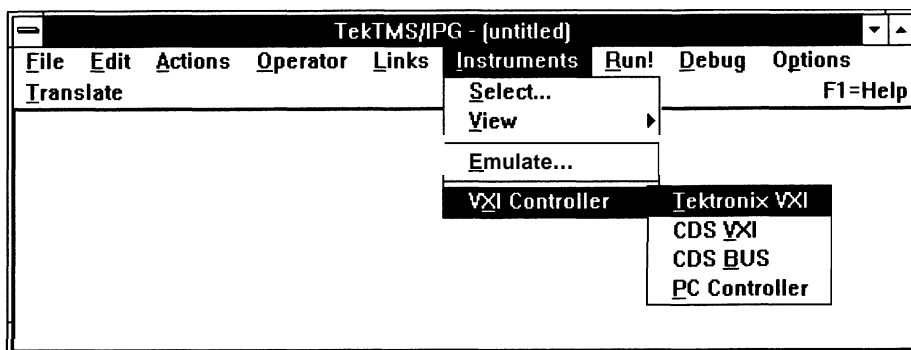
The Instruments Controller menu provides the following choices of instrument controller:

■ Tektronix **VXI** — includes embedded VXIbus controllers such as the Tektronix VX4530, VX4535, VX5530, VX5535, and Radisys EPC-2.

■ CDS **VXI** — includes embedded VXIbus controllers such as the CDS 73A-161 and the Tek/CDS VX4542 and VX4544.

■ CDS BUS — includes embedded CDSBUS controllers such as the 53B-ACX and 53B-ACZ.

■ PC Controller — includes any PC compatible with a National Instruments GPIB interface card.

The combination of controller type and ISD file bus note specifies the type of instrument interface used to communicate with connected instruments. For example:

■ Tektronix **VXI/VXIINTERNAL** — If Tektronix VXI is selected as the instrument controller and a VXIINTERNAL bus note is in the ISD file selected in the Instruments Select dialog, then the Radisys Message Delivery System is used to perform I/O with VXIbus instruments.

■ CDS **VXI/VXIINTERNAL** — If CDS VXI is selected as the instrument controller and a VXIINTERNAL bus note is in the ISD file is selected in the Instruments Select dialog, then the CDS VXIbus I/O routines are used to perform I/O with VXIbus instruments.

■ CDS **BUS/CDSBUS** — If CDS BUS is selected as the instrument controller and a CDSBUS bus is not in the ISD file selected in the Instruments Select dialog, then the CDS BUS I/O routines are used to perform I/O with CDSBUS instruments.

Any **Controller**/**GPIB** — If any of the controller types is selected and a GPIB bus note is in the ISD file selected in the Instruments Select dialog, then the National GPIB interface routines are used to perform I/O with GPIB instruments.

The controller type selection is also used by TekTMS/RTG and TekTMS/IDG to determine the appropriate instrument I/O functions to call when generating C code for PRG and ISD files respectfully.

■ If Tektronix VXI is chosen, then the generated I/O calls for ISD files with a VXIINTERNAL busnote block will use routine calls with the format **TekV-XI**function.

■ If CDS VXI is chosen, then the generated I/O calls for ISD files with a VXIINTERNAL busnote block will use routine calls with the format **TekCDS**function.

■ If CDS BUS is chosen, then the generated I/O calls for ISD files with a CDSBUS busnote block will use routine calls with the format **TekCDS-BUS**function.

■ For ISD files with a GPIB busnote block the generated I/O calls will have the format **TekGPIB**function.

TekTMS/RTG and TekTMS/IDG read a value from the WIN.INI file to determine the type of controller selected. In the WIN.INI file selection [TekTMS/IPG] and keyword VXI: one of several entries is allowed. These entries are TEKTRONIX, **CDSVXI**, CDSBUS, and PC.

A test may be developed to run on a specific type of instrument controller on any controller type by choosing the desired target controller from the Instruments Controller menu. The test can be executed by using the Emulation option in the Instruments menu to direct instrument responses to come from a dialog box on the controller screen or to read instrument responses from a data file.

Run! Menu

Run! executes the current test procedure. Other menu choices are disabled until the test procedure run is complete. Run clears any variable values and initializes the run time stack. If the test procedure has been changed, you are asked if you wish to save the change before running the test.

Debug Menu

The Debug menu contains several items useful in debugging test procedures. These items include control of single step execution, examination of variables, breakpoints, and tracing bus communications. The following picture shows the Debug menu. In this example, the Debug menu item is checked. This means that TekTMS/IPG is in debug mode. When in debug mode, TekTMS/IPG disables all other main menu items. This prevents you from attempting operations that are not allowed when in debug mode.

File	Edit	Actions	Operator	Links	Instruments	Run!	Debug	Options	Translate

Debug

PROCEDURE DEMOTEST ( )
REMARK Locate R3 Gain Adj and preset it.
  PROMPT PICTURE TEKPIC.BMP
  PROMPT Set R3 Gain Adj to midrange.
REMARK Initialize instruments for tests to follow.
  SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITU
  SETTING dmm acvthree acvrange
REMARK Adjust R3 Gain Adj to its nominal value.
  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4
    MEASUREMENT dmm acvreading:gaincal
  END_ADJUSTMENT
REMARK Initialize test procedure variables.
  CALCULATE index& = 0
  CALCULATE testdatetime$ = date$()+" "+time$()
  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)
REMARK Test the frequency response from 10 Hz to 100 kHz.
  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG
REMARK Set the Function Generator frequency to "freq$".
  CALCULATE freq$ = str$(freq)
  SETTING fg FREQUENCY:freq$
REMARK Delay for DMM range change.

Debug menu:
- Restart
- Continue   F5
- Step   F9
- Next   F10
- Examine/Change...
- Main Test
- Set Breakpoint
- Remove Breakpoint
- Remove All Breakpoints
- Trace Bus

The **Debug** menu contains the following selections:

Debug

Debug is either **ON** (checked) or OFF (not checked). If checked, TekTMS/IPG is in debug mode and the other debug menu items are enabled. If TekTMS/IPG is not in debug mode (the default) then the **Debug** menu items **Restart, Continue, Next, Step,** and **Examine/Change** are not enabled. You may trace bus communications or set and remove breakpoints without being in debug mode.

Restart

Restart the test procedure from the **Begin Procedure** step. The test procedure will run until it reaches the end of the test or until a breakpoint is encountered.

Continue

Continue execution of the test from the current step. The test procedure will run until it reaches the end of the test or until a breakpoint is encountered. If no steps have been executed since entering debug mode, this has the same effect as **Restart.**

Step

Step single steps the test procedure. If the step to be executed is a **Call Procedure,** the called procedure is shown in the outline view and the **Begin Procedure** step is highlighted.

Next

Next single steps the test procedure. If the step to be executed is a Call Procedure, the called procedure is executed without being shown and execution is halted when the called procedure returns.

Examine/Change

Examine/Change will bring up another dialog. This dialog shows all the test procedure variables that have been created up to current test step. A variable does not appear in this dialog until it has a value assigned to it. At the beginning of a debug session only the default global variable PassFail will be displayed. When Examine/Change is selected, the TekTMS/IPG outline view window is reduced in size to accommodate this dialog. Usually the screen is split vertically with the left half the TekTMS/IPG outline view and the right half the **Examine/Change** dialog.
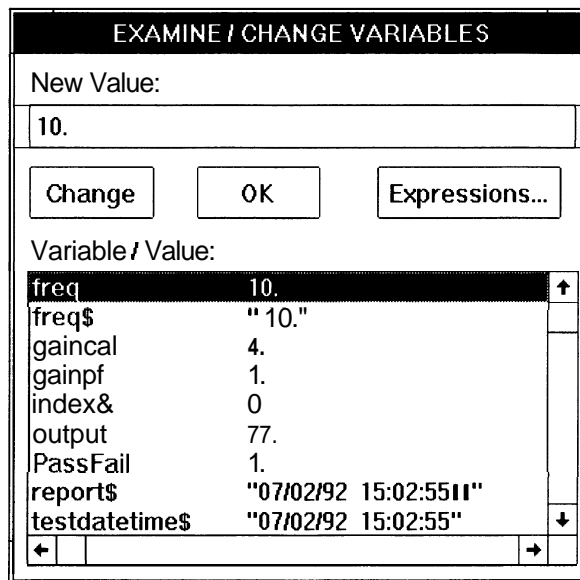
- **Variable/Value:** lists all current test procedure variables. A variable is not listed until it has been assigned a value. If one of the variables in the list is selected, its value is placed into the New Value edit box. If the variable entry is an array, double clicking on the array entry will bring up the **Examine/Change** Array Variable dialog.

- New Value: lets you change the value of the variable selected in the **Variable/Value** list box. The new value will be evaluated and the variable updated when the Change button is pressed.

- Change will check the value of the expression in the New Value edit box, and if it is compatible with the selected variable type, will update the variable with the new value. If the expression is not valid, or the type is not correct, then the appropriate error messages are displayed.

- **Expressions...** will bring up a dialog like the following one, that shows the last three expressions evaluated during debug execution and their value. Use this to determine the value of complex expressions or the value of **IF THEN ELSE** and **WHILE DO** expressions.

```
┌──────────────────────────────────────┐
│         EXAMINE EXPRESSIONS          │
├──────────────────────────────────────┤
│ Last 3 expression evaluation values: │
│ freq$ (4)          " 10."      [↑]   │
│ 300                300               │
│ str$(freq) (4)     " 10."      [↓]   │
│ [←] [          ]              [→]    │
│                                      │
│              ┌────────┐              │
│              │   OK   │              │
│              └────────┘              │
└──────────────────────────────────────┘
```
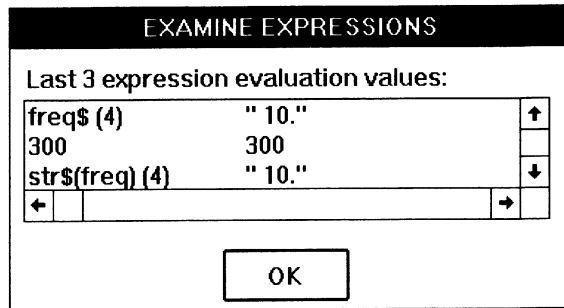
- **Examine/Change Array Variables** dialog shows the values of individual array elements. This dialog appears when you double click on an array entry in the **Examine/Change** variable list box.

```
┌──────────────────────────────────────────┐
│      EXAMINE / CHANGE ARRAY VARIABLES    │
├──────────────────────────────────────────┤
│ Variable I Value:   Start: [0]   End: 10 │
│ ┌────────────────────────────────────┐   │
│ │ values[1]      1.              [↑]  │   │
│ │ values[2]      2.                   │   │
│ │ values[3]      0.                   │   │
│ │ values[4]      0.                   │   │
│ │ values[5]      0.                   │   │
│ │ values[6]      0.              [↓]  │   │
│ └────────────────────────────────────┘   │
│ New Value:                               │
│ ┌────────────────────────────────────┐   │
│ │ 2                                  │   │
│ └────────────────────────────────────┘   │
│ ┌──────────┐  ┌────────┐  ┌──────────┐   │
│ │  Change  │  │   OK   │  │ Position │   │
│ └──────────┘  └────────┘  └──────────┘   │
└──────────────────────────────────────────┘
```
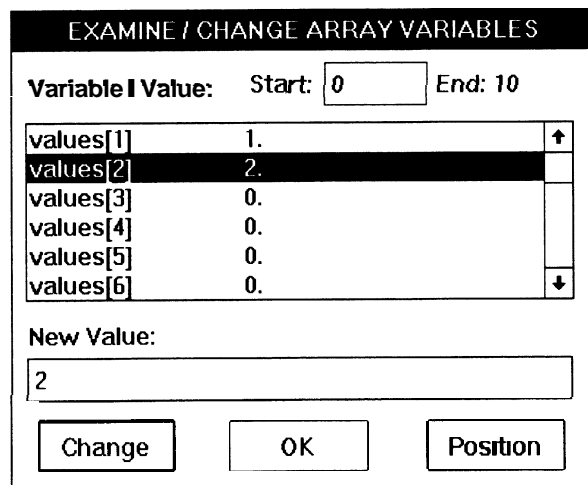
- **Variable/Value** is a list of the array entries and their values. Selecting one of the list entries will place the value of that array element into the **New Value** edit box.

- **New Value** lets you change the value of the variable selected in the **Variable/Value** list box. The new value will be evaluated and the variable updated when the **Change** button is pressed.

- **Change** will check the value of the expression in the **New Value** edit box, and if it is compatible with the selected variable type, will update the variable with the new value. If the expression is not valid, or the type is not correct, then the appropriate error messages are displayed.

- **Start** allows changing the starting element number of the displayed array elements. If the array displayed is large, you may wish to limit the amount of data displayed. This can cut down on the time it takes to reach a specific array element to display or change that element's value.

- **End** lists the value of the number of the last array element displayed.

- **Position** will display the array element list **Variable/Value** starting at the array entry shown in the **Start** edit box.

  OK will close the **Examine/Change Array Variables** dialog.

Main Test

Main Test will bring up the starting main test procedure. If you have traced execution into a called procedure, this menu item will reload the main test procedure. This is useful if an execution error occurred during execution and you want to return to the main test with out having to use the **File** menu **Open** command. This way of returning to the main test is faster than doing a **File** menu **Open.** This item can be used even if debug is not on.

Set Breakpoint

Set Breakpoint sets the breakpoint symbol (a lower case 'b' by the outline view entry for a test step) on all selected test steps. While you are in debug mode, a breakpointed step will stop execution. In standard **Run** mode, breakpointed steps do not stop execution. A breakpoint will be saved with the step when the test procedure is saved. When you are in debug mode and execute a Call Procedure step that has a breakpoint in the called test, execution will halt at the breakpointed step.

Remove Breakpoint

Remove Breakpoint removes the breakpoint symbol from all selected steps.

Remove All Breakpoints

Remove All Breakpoints removes the breakpoint symbol from all test steps in the current test procedure.

Trace Bus

Trace Bus lets you turn ON (checked) or turn OFF (not checked) bus communications tracing. Bus communication tracing shows all bus dialogs (reads and writes with instruments) in a window.

Options Menu

The following Options Menu will appear whenever you select the **Options** menu item from the Main Menu, or by pressing and holding the ALT keyboard key while pressing the P key (while in the Main Menu). This menu allows you to select or exit the Remarks Only function:

```
 Remarks Only
 Globals
```

Remarks Only

Select this menu item by pointing and clicking with the mouse, or by pressing the M keyboard key. Selecting **Remarks Only** (which is indicated by a check mark (J) in front of the command), will cause only Remarks steps to be displayed. Selecting **Remarks Only** again (causing the check mark (J) to disappear), will cause all test procedure steps to be displayed.

Globals

Selecting this menu item will bring the **Global Variables** dialog to the top of the screen.

Translate Menu

The following Translate Menu will appear whenever you select the **Translate** menu item from the Main Menu, or by pressing and holding the ALT keyboard key while pressing the T key (while in the Main Menu). The Translate Menu allows you to convert test procedures and instrument driver files to the C programming language for use with the TekTMS Run Time Generator (RTG) package.

NOTE

You must have the TekTMS RTG software to use these commands. If you attempt to use the commands in this menu without the RTG, you will get an error message.

```
 Start RTG...
 Start IDG...
```

Start <u>R</u>TG

Select this menu item by pointing and clicking with the mouse, or by pressing the R keyboard key. Use this command to start the RTG application to convert program (.PRG) files.

Start <u>I</u>DG

Select this menu item by pointing and clicking with the mouse, or by pressing the I keyboard key. Use this command to start the IDG application to convert driver (.ISD) files.

NOTE

For further information, refer to the Run Time Generator (RTG) Users Manual.

Help Menu

You can access the Help Menu by pressing the F1 keyboard key when you have a dialog box opened from the Operator or Actions Menus. When you select Help, a message box will appear giving information about the dialog box you currently have open.

Instrument Front Panel Menu

The contents of the Instrument Front Panel Menu will depend upon the instrument front panel view you select. An instrument front panel view with an associated Instrument Front Panel Menu appears whenever you perform one of the following sequences:

Sequence A

1. You select **Instruments** from the Main Menu bar (an Instruments Menu will appear), then:

2. You select **View...** from the Instruments Menu a list of related instruments appears.

3. You highlight an instrument name.

Sequence B

You point to and double-click with the mouse on an Instrument Front Panel Driver Icon at the display bottom.

Sequence C

You point to and double-click with the mouse on a test procedure SETTING or MEASUREMENT step for the instrument whose front panel you want to view.

What This Menu Does

An instrument front panel display allows you to select or enter values for setting the controls on a specific test instrument. The associated Instrument Front Panel Menu allows you to perform the following:

> Select the type of procedure step to create (setting or measurement)

> Select the interaction mode with the instrument: Interactive (online), Setting Only (online), Measurement Only (online), or No Interaction (offline)

- Assign program variables to the instrument controls

- Select the instrument front panel view to be displayed

> Select Help

- Select a one-time or automatic mode for updating instrument control settings on the view display

Example

The following instrument front panel display is representative only, as the front panel view for each instrument may be different. Some instruments may have a front panel view similar to the instrument front panel physical layout, while others may have a functional view, or one instrument may have multiple views.
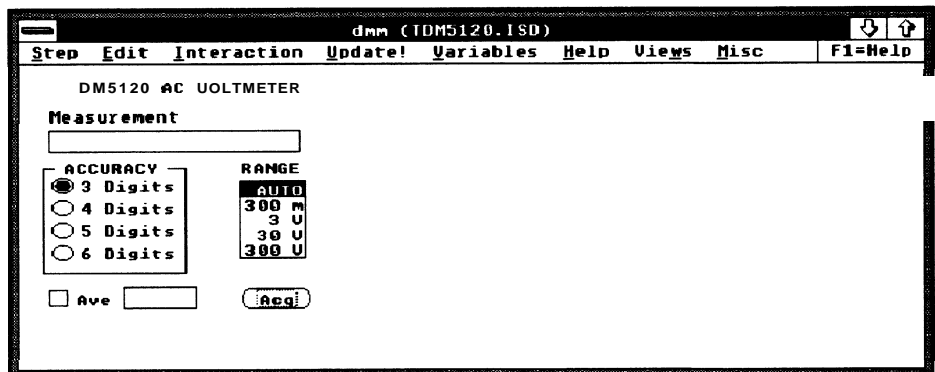
Step

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the S key. Step causes the following menu to appear, allowing you to select the type of instrument test procedure step (setting, learn, or measurement) you want to create for the current instrument selection and setting view.

```
S̲ave All Settings
Sa̲ve Selected Settings...
L̲earn Settings...

Save A̲ll Measurements
Save Selected Measurements...

C̲lose
```
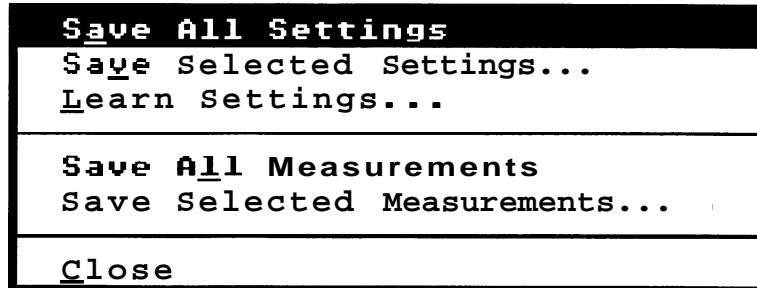
■   Save All Settings — Select this menu item by pointing and clicking with the mouse, or by pressing the A keyboard key. Save All Settings creates a test procedure step that saves the settings of all instrument controls as they appear in the current Instrument Front Panel view.

NOTE

If any instrument control appears in more than one view, its current setting will always be the last setting made in a view where the setting for that control name was saved.

■   Save Selected Settings**...** — Select this menu item by pointing and clicking with the mouse, or by pressing the V keyboard key. Save Selected Settings**...** opens the following dialog box, allowing you to select the instrument controls that are set by the test procedure step.
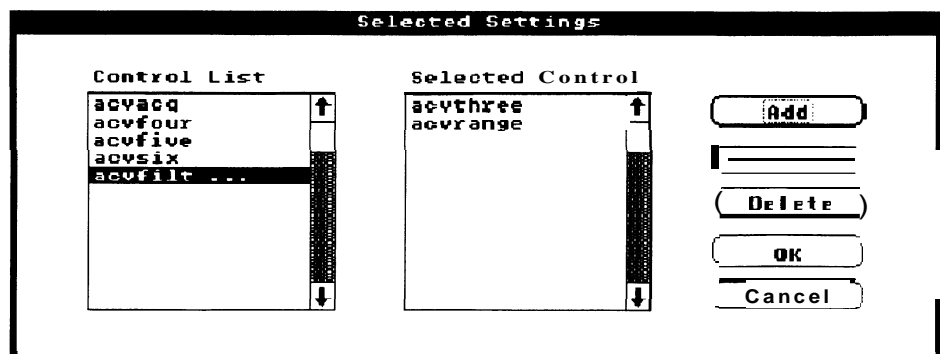
IPG provides the following dialog box items for user interaction:

■ **Control List** — **A** list box containing the names of the instrument controls that are defined in the Setting View Block of the currently selected instrument driver (.ISD) file, and available for you to selectively save in the test procedure.

■ **Selected Control** — A list box containing the names of the instrument controls that the test procedure has selected to be set. The order in which the controls are selected determines the order in which the settings are sent to the instrument when the procedure executes. To select a control, highlight its name in the **Control List** and select the **Add** pushbutton. (You can also point and double-click the mouse on the control name to add it.)

NOTE

The order of the controls in the Selected Control list determines the order the setting will be made.

■ **Add** — Select this pushbutton to add a highlighted name in the **Control List** to the **Selected Control** list.

■ **Add All** — Select this pushbutton to automatically add all the names in the **Control List** to the **Selected Control** list. The names are added whether you have highlighted them or not.

■ **Delete** — Select this pushbutton to delete a highlighted name from the **Selected Control** list.

● **OK** — Select this pushbutton to complete the **Save Selected Settings....**

■ **Cancel** — Select this pushbutton to cancel the **Save Selected Settings....**

■ **Learn Settings...** — Select this menu item by pointing and clicking with the mouse, or by pressing the L keyboard key. **learn Settings...** opens the following dialog box, allowing you to query the instrument for its current settings as defined in the Learn Block in the instrument driver (.ISD) file, edit the settings (if desired), and create a test procedure step that will set the instrument to the learned settings.
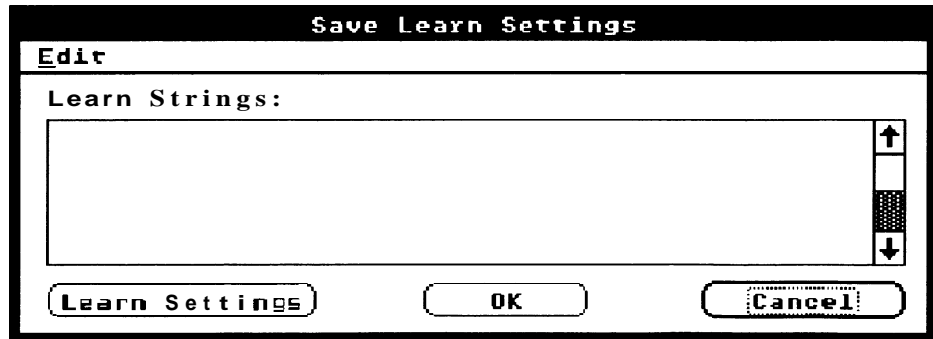
```
┌─────────────────────────────────────────────────────────────┐
│                    Save Learn Settings                        │
├─────────────────────────────────────────────────────────────┤
│  Edit                                                         │
├─────────────────────────────────────────────────────────────┤
│  Learn Strings:                                               │
│  ┌──────────────────────────────────────────────────────┬─┐  │
│  │                                                        │▲│  │
│  │                                                        ├─┤  │
│  │                                                        │ │  │
│  │                                                        │▓│  │
│  │                                                        │ │  │
│  │                                                        ├─┤  │
│  │                                                        │▼│  │
│  └──────────────────────────────────────────────────────┴─┘  │
│  ( Learn Settings )        (    OK    )        ( Cancel )      │
└─────────────────────────────────────────────────────────────┘
```
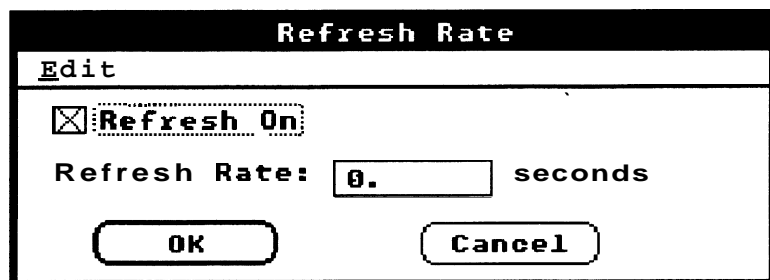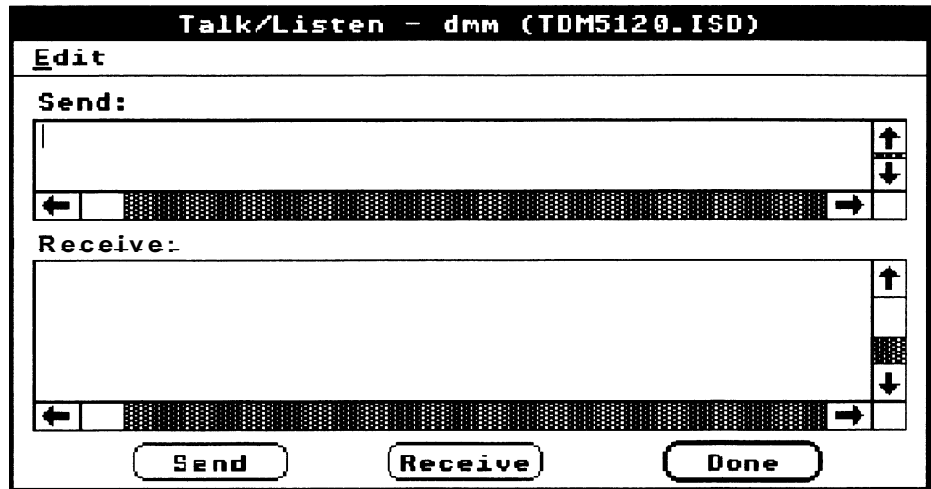
- **Edit** — Select this menu item by pointing and clicking with the
  mouse, or by pressing and holding the ALT keyboard key while
  pressing the E key. **Edit** allows you to edit the dialog box items.
  Refer to the *Edit Menu* description (previously given in this section)
  for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- **Learn Strings:** — An edit box where the current instrument settings
  (as defined in the Learn block of the instrument driver (.ISD) file) will
  appear when you select the Learn Settings pushbutton and the test
  procedure returns the selected instrument's settings. You can edit
  the settings after they are returned, if they are in ASCII format.

- **Learn Settings:** — Select this pushbutton to query the instrument
  whose front panel is displayed for its front panel settings. When
  queried, the instrument returns its current settings (displayed in the
  Learn Strings: edit box). This control is displayed in gray if the
  instrument driver (.ISD) file does not contain a Learn block.

- OK — Select this pushbutton to complete the **Learn Settings....**

- **Cancel** — Select this pushbutton to cancel the **Learn Settings....**

- **Save All Measurements** — Select this menu item by pointing and
  clicking with the mouse, or by pressing the L keyboard key. **Save All
  Measurements** creates a test procedure step that queries the instru-
  ment for the current measurement value(s) for controls defined by the
  Measurement blocks in the currently selected instrument front panel
  view.

- **Save Selected Measurements...** — Select this menu item by pointing
  and clicking with the mouse, or by pressing the C keyboard key. **Save
  Selected Measurements...** opens the following dialog box, allowing you
  to selectively save the values returned by the instrument for controls
  defined in the Measurement block of the currently selected instrument
  driver (.ISD) file.

The measurement data from the instrument will be placed into an IPG variable. IPG can generate the variable automatically, or you can name it yourself. If IPG generates the variable, the name will be of the form '*ITMSname.controlTYPE*', where the name starts with the letter '*I*' followed by the TMS Name of the instrument. Following the period, is the name of the selected control, then the type designator, which is either '#' (*floating point* number), '&' (*integer*), '$' (*string*), or '~' (waveform). Use the Variables Menu to assign a name to a control.
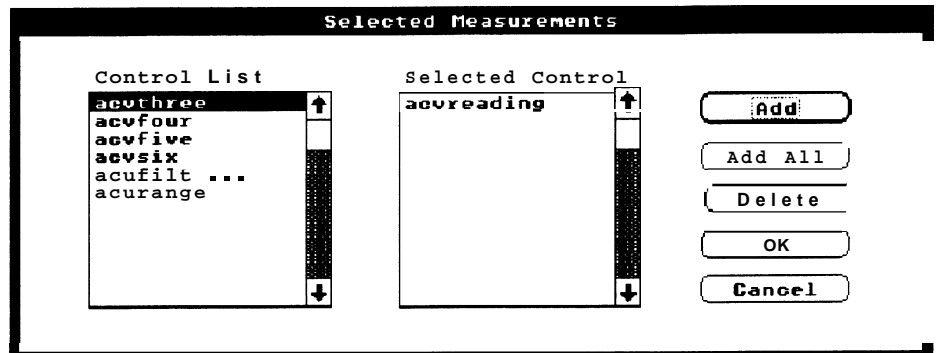
IPG provides the following dialog box items for user interaction:

- **Control List —** A list box containing the names of instrument controls (including indicators) that are defined in the Measurements block of the currently selected instrument driver (.ISD) file, and available for you to selectively save in a test procedure.

- **Selected Control —** A list box containing the names of the instrument controls you have selected to be saved for the test procedure. To select a control, highlight its name in the **Control List,** then select the **Add** pushbutton. (You can also point and double-click the mouse on the control name to add it.)

NOTE

The order in which the Control List names are selected determines the order in which measurements are made.

- **Add** — Select this pushbutton to add a highlighted name in the **Control List** to the **Selected Control** list.

- **Add All** — Select this pushbutton to automatically add all control names in the **Control List** to the **Selected Control** list. These names will be added whether you have highlighted them or not.

- **Delete** — Select this pushbutton to delete a highlighted name in the Selected Control list.

- **OK** — Select this pushbutton to complete the **Save Selected Measurements....**

Cancel — Select this pushbutton to cancel the Save Selected Measurements**....**

Edit

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

Close

Select this menu item to close the Step Menu.

Interaction

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the I keyboard key. Interaction causes the following Interaction Menu to appear, allowing you to select the type of instrument interaction that will occur when you manipulate the front panel controls on the instrument front panel display and create the step.

```
 ✓Full Interaction
   Setting Only
   Monitor Only
   No Interaction
```
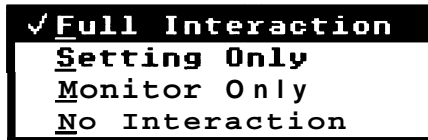
■ **Full** Interaction — Select this menu item by pointing and clicking with the mouse, or by pressing the F keyboard key. **Full** Interaction places the instrument on line and selects a setting and measurement instrument interaction mode where any changes to the instrument front panel view are sent to the instrument (setting mode), and any changes that occur at the instrument (measurements), that are represented in the front panel view, are returned to update the view display. The controls that represent the current instrument settings are highlighted. This mode is similar to making hands-on, real-time control settings and measurements using a nonprogrammable, stand-alone instrument.

Setting Only — Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. Setting Only places the instrument on line and selects an instrument setting only mode where any changes to the instrument front panel view are sent to the instrument (setting mode), but the instrument does not return any changes (measurements) to update the view display. The controls that represent the current instrument settings are highlighted. This is similar to making hands-on, real-time control setting on a stand-alone instrument without making a measurement.

- **Monitor Only** — Select this menu item by pointing and clicking with the mouse, or by pressing the M keyboard key. **Monitor Only** places the instrument on line and selects an instrument measurement only mode where the instrument is queried for and returns any changes to update the instrument controls represented on the view display (measurements), but changes to the controls on the front panel view are not sent to the instrument (settings). This mode is similar to making hands-on, real-time measurement using a nonprogrammable, stand-alone instrument without changing its current settings.

- **No Interaction** — Select this menu item by pointing and clicking with the mouse, or by pressing the N keyboard key. **No Interaction** places the instrument off line. This command disables both the setting and/or measurement interactive modes with the actual instrument. Control setting changes made in this mode change the instrument front panel view displays, but do not send any commands to the instrument, and do not query the instrument for any changes to its measured values.

Update!

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the U key. **Update!** queries the instrument in the current instrument front panel view display, and uses the returned front panel control values (measurements) to update the display. (Refer to the previous **Interaction** description for more information on when and if the measurements are updated.)

Variables

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the V keyboard key. **Variables** causes the following Variables Menu to appear, allowing you to assign a test procedure variable name to an instrument control on the current front panel view display. Once you have assigned a variable to a control, information is passed between the test procedure and the instrument through that variable. For example, during a setting step, the contents of the variable are sent to the Setting block in the instrument driver file, which sends the command to the instrument to set the control. During a measurement step, the value returned from the instrument is stored in the variable.

```
 Current  Control...
 Current  View..  ▪
```

■ Current Control**...** — Select this menu item by pointing and clicking with the mouse, or by pressing the C keyboard key. Current Control**...** opens the following dialog box, allowing you to assign a test procedure variable name to whichever control had the focus in the current instrument front panel view when you selected this command. The focused control selection can be changed before selecting this command by pointing and clicking the mouse on another control name, or by pressing the TAB keyboard key to focus on another control name. The control name focus changes each time you press the TAB key. To assign variables to multiple controls, use Current View**....**
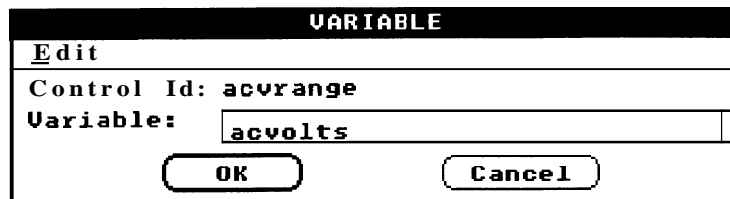
```
┌─────────────────────────────────────────────┐
│                  VARIABLE                     │
├───────────────────────────────────────────────┤
│ Edit                                          │
├───────────────────────────────────────────────┤
│ Control Id: acvrange                          │
│ Variable:    ┌──────────────────────────┐    │
│              │ acvolts                   │    │
│              └──────────────────────────┘    │
│       ( OK )               ( Cancel )         │
└───────────────────────────────────────────────┘
```

■ Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ Control Id: — A list box containing the name of the focused control that will be assigned a variable name.

■ Variable: — An edit box where you enter the test procedure variable name for the control listed in the Control Id: list box. The variable name must have the correct data type suffix, or an error message specifying the data type required will appear. The first character of the variable name must be alphabetic, while the following characters can be alphanumeric. The name can have up to 255 characters, however, the first 32 characters must be unique.

■ **OK** — Select this pushbutton to complete the Current Control**...** action.

■ Cancel — You can select this pushbutton to cancel the Current Control**....**

■ Current View**...** — Select this menu item by pointing and clicking with the mouse, or by pressing the U keyboard key. Current View**...** opens the following dialog box, allowing you to assign, delete, or edit test procedure variable names for all instrument controls on the current view display.
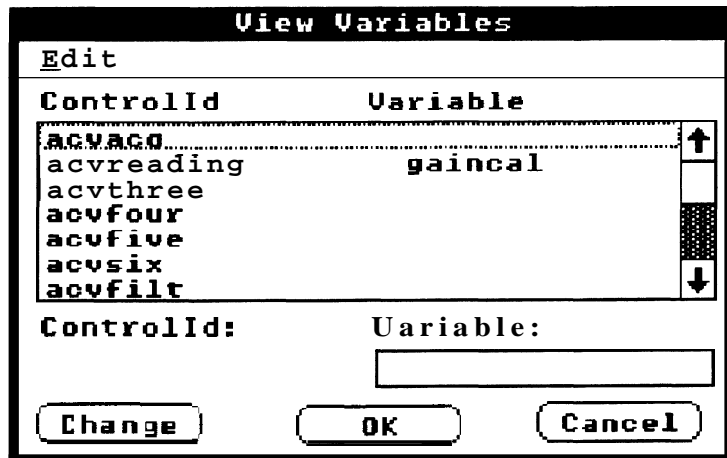
```
          View Variables
  Edit

  ControlId        Variable

  acvago.................................... ↑
  acvreading      gaincal
  acvthree
  acvfour
  acvfive
  acvsix
  acvfilt                                   ↓

  ControlId:        Variable:
  [                ] [             ]

  ( Change )    (    OK    )    ( Cancel )
```

- Edit — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the **ALT** keyboard key while pressing the E key. Edit allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

- Control ID-Variable— A list box containing the names of the instrument controls and their currently assigned variables.

- Control id: — A list box containing the name of the focused control to be assigned a variable name.

- Variable: — An edit box where you enter the test procedure variable name to be assigned to the control name in the Control id: list box. If a variable name was previously assigned to the desired control name, it will appear in this box when you select the control name from the Control ID-Variable list box. You can edit any name in this box with the Edit command, or by editing with the keyboard, then selecting the Change pushbutton. Any new or changed variable must have the correct data type suffix, or an error message will appear indicating the correct data type required.

    The variable name must appear in the right hand column of the list box before IPG can use it. (If it does not appear there, make certain that you have the correct entries in the Control Id: and Variable: edit boxes, then select Change.)

- Change — Select this pushbutton to complete keyboard editing of a variable in the Variable: list box, or the addition of a variable to a control name.

- **OK** — Select this pushbutton to complete the Current View**...** action.

- Cancel — Select this pushbutton to cancel the Current View**....**

Help

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the U keyboard key. **Help** causes the Instrument Front Panel Help Menu for the displayed instrument to appear. The commands contained in this menu depend upon the contents of the .HLP file created for the instrument. The following menu is only representative of a Help Menu: The types of help messages, displays, additional menus, dialog boxes, etc., that appear after selecting a Help Menu command are dependent upon the instruments .ISD and .HLP files.

```
Instrument
Control
```

Views

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the W key. **Views** causes a menu similar to the following to appear, allowing you to select the displayed view of the currently displayed instrument.

This following menu is only representative, as the quantity and type of views available for each instrument is determined by the instrument driver (.ISD) file. Some instruments may have a front panel view similar to its physical layout, while others may have a functional view, or a single instrument may have multiple views.

Since each instrument view is unique to the instrument, the Views Menu may contain the name of one or more views that you can select for display. If there is only one view, that view is selected (highlighted) whenever the menu is open. If there is more than one view, the view currently displayed is highlighted when the menu is open, and it also has a check mark (J) in front of its name. To select a new view, point and click the mouse on the new view name in the menu.

When you have Full Interaction mode enabled (from the Interaction Menu), and you select a different view, all measurement (or query) blocks for the new view are executed to put the front panel in the same state as the instrument. If you do not want all query blocks to execute when you change views, first select the No Interaction mode (from the Interaction Menu), then change the view. If you then need to control the instrument, reselect the Full Interaction mode.

```
✓ ACV
DCV
```

<u>M</u>isc

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the M key. <u>**Misc**</u> opens the following Miscellaneous Menu, allowing you to select the rate at which an instrument front panel view display is updated (by querying the instrument for its current measurements) and acting on the responses. This menu also allows you to send messages to a selected instrument and view the responses.

```
┌─────────────────────────┐
│  Refresh Rate...        │
├─────────────────────────┤
│  Talk/Listen...         │
└─────────────────────────┘
```

■ **Refresh Rate...** — Select this menu item by pointing and clicking with the mouse, or by pressing the R keyboard key. **Refresh Rate...** opens the following dialog box, allowing you to enable the Refresh Rate function and to set the rate (in seconds) at which an instrument is queried for updating the instrument front panel view display.

```
┌──────────────────────────────────────────┐
│              Refresh Rate                  │
├──────────────────────────────────────────┤
│  Edit                                      │
├──────────────────────────────────────────┤
│  ☒ Refresh On                              │
│                                            │
│  Refresh Rate:  ┌────────┐  seconds        │
│                 │ 0.     │                 │
│                 └────────┘                 │
│  ┌──────────┐        ┌──────────┐          │
│  │    OK    │        │  Cancel  │          │
│  └──────────┘        └──────────┘          │
└──────────────────────────────────────────┘
```

● **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **Refresh On:** — Selecting this a check box enables or disables the Refresh Rate function. When the box contains an X, the Refresh Rate function is enabled; when the box does not contain an X, it is disabled.

■ **Refresh Rate:** — An edit box where you set the number of seconds that will elapse before an on line instrument is queried for its current measurements and the instrument front panel view is updated.

■ **OK** — Select this pushbutton to complete the <u>**Refresh Rate...**</u> action.

■ **Cancel** — Select this pushbutton to cancel the **Refresh Rate....**

■ **T̲alk/Listen...** — Select this menu item by pointing and clicking with the mouse, or by pressing the T keyboard key. **T̲alk/Listen...** opens the following dialog box, allowing you to communicate directly with the instrument whose front panel view is selected. This communication must use the instrument's command set. The Title Bar in the dialog box displays the IPG name assigned and the .ISD file name for the selected instrument.

```
┌─────────────────────────────────────────────────────┐
│        Talk/Listen  —  dmm (TDM5120.ISD)            │
│ Edit                                                 │
├─────────────────────────────────────────────────────┤
│ Send:                                                │
│ ┌─────────────────────────────────────────────┬──┐  │
│ │ |                                            │ ↑│  │
│ │                                              │ ↓│  │
│ ├──┬────────────────────────────────────────┬──┤    │
│ │←│                                        │→│      │
│ Receive:                                             │
│ ┌─────────────────────────────────────────────┬──┐  │
│ │                                              │ ↑│  │
│ │                                              │  │  │
│ │                                              │  │  │
│ │                                              │ ↓│  │
│ ├──┬────────────────────────────────────────┬──┤    │
│ │←│                                        │→│      │
│                                                      │
│   (  Send  )      ( Receive )      (  Done  )       │
└─────────────────────────────────────────────────────┘
```

■ **Edit** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the E key. **Edit** allows you to edit the dialog box items. Refer to the *Edit Menu* description (previously given in this section) for the menu and information on its use.

IPG provides the following dialog box items for user interaction:

■ **Send:** — An edit box where you enter the message to be sent to the instrument.

■ **Receive:** — A message box where the response from the instrument appears.

■ **Send** — Select this pushbutton to send the message in the **Send:** edit box to the instrument

■ **Receive** — Select this pushbutton to query the instrument for its response to the message sent using **Send.** The response will be returned in the **Receive:** list box.

■ **Done** — Select this pushbutton to close the dialog box.

Waveform Menu

A waveform display window and an associated menu similar to the one following will appear when an instrument front panel view (.ISD file) has a control type called Waveform Display and you select its icon, or when IPG executes a test procedure containing a waveform display step.

When an instrument front panel view has a Waveform Display control type, and you display the view or reduce it to an icon, another icon (it looks like a miniature waveform) will be displayed at the bottom of the screen. This icon represents the waveform display and menu, and you can display it by double-clicking with the mouse, or clicking with the mouse and then selecting the **Restore** command from the Control Menu that appears.

When IPG executes a test procedure containing a waveform display step, a waveform display and menu appears when that step executes.

For more information and a tutorial with illustrations on using the Waveform Menu, see Waveform Displays in Section 5, Advanced Applications.
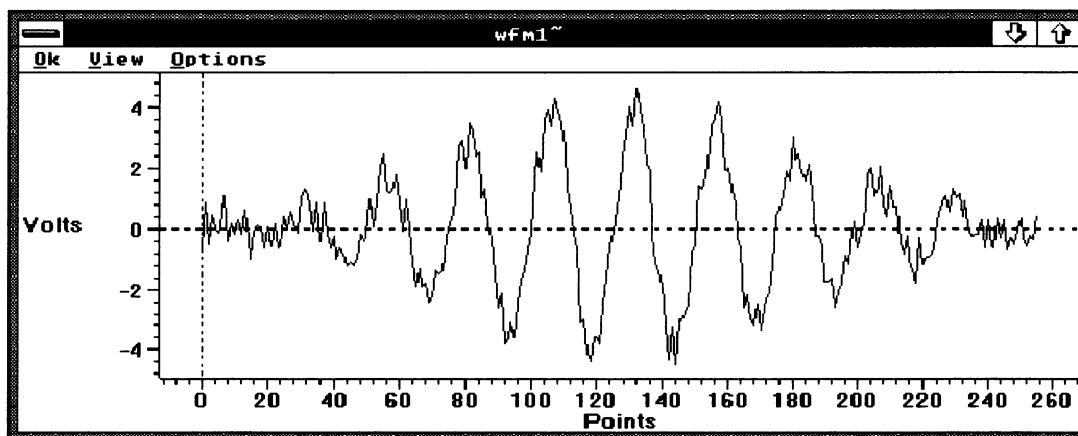
Ok — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the O key. **Qk** terminates the waveform display and returns to the Main Menu.

■ **View** — Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the V key. **View** opens the following View Menu, allowing you to select a waveform display Zoom (expansion) or Full View (reduction) mode.

Zoom — Select this menu item by pointing and clicking with the mouse, or by pressing the Z keyboard key. **Zoom** enters a waveform display expansion mode, where an enclosing rectangle is used to select a region on the waveform display that will be expanded in the display area.

When you select **Zoom,** the normal cursor changes to a Left Corner graphic symbol (⌐). To select the region you want to expand, move the cursor (do not click the mouse) to a position on the display where you want the upper left corner of the enclosing rectangle to start. Then press and hold the left mouse button while moving the cursor to the position where you want the lower right corner of the enclosing rectangle to be. This will create an enclosing rectangle. Release the left mouse button.

Zooming is a repeatable action that you can perform on each new display, until Zooming reaches a waveform display of only two points. You can not Zoom further than a two-point display.

■ **Full View —** Select this menu item by pointing and clicking with the mouse, or by pressing the F keyboard key. **Full View** returns a zoomed display to a display of the entire waveform.

Options

Select this menu item by pointing and clicking with the mouse, or by pressing and holding the ALT keyboard key while pressing the O key. **Options** opens the following **Options** Menu, allowing you to select waveform display enhancements.

```
┌─────────────────────────────────┐
│ Scroll Bars                     │
│ Grid                            │
├─────────────────────────────────┤
│ Display Cursor                  │
│ Waveform Cursor                 │
│ Amplitude Cursors               │
│ Time Cursors                    │
├─────────────────────────────────┤
│ Colors and Styles...            │
│ Labels...                       │
└─────────────────────────────────┘
```
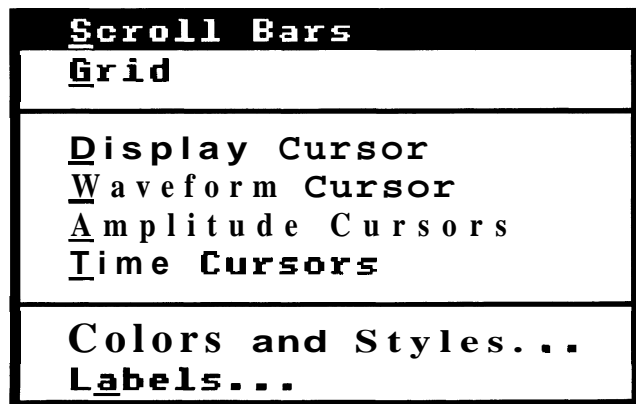
■ **Scroll Bars** — Select this menu item by pointing and clicking with the mouse, or by pressing the S keyboard key. **Scroll Bars** adds vertical and horizontal scroll bars to the waveform display. After selecting this command, when you select the Options Menu again, **Scroll Bars** will have a check mark (√) to its left indicate that it is selected. Selecting it again will disable the feature.

You can also scroll the waveform display in two other ways, as follows:

● By using the directional arrow keys on the numeric keypad or on a separate arrow keypad (some keyboards have both)

■ By moving the mouse cursor just off the waveform display and slightly to the left or below the scales. When you do this, the cursor changes to a double-ended arrow cursor. When this cursor is to the left of the vertical scale, clicking the left or right mouse button moves the display vertically. When this cursor is below the horizontal scale, clicking the left or right mouse button moves the display horizontally.

■ **Grid** — Select this menu item by pointing and clicking with the mouse, or by pressing the G keyboard key. **Grid** adds vertical and horizontal grids to the waveform display at each major vertical and horizontal scale mark. After selecting this command, when you select the Options Menu again, **Grid** will have a check mark (**J**) to its left. Selecting it again will disable the feature.

NOTE

The following four cursor features are mutually exclusive selections. When you select one of them, any other one that is already selected will be disabled.

Display Cursor — Select this menu item by pointing and clicking with the mouse, or by pressing the D keyboard key. **Display Cursor** adds a vertical and horizontal display cursor to the waveform display. You can control each cursor independently by the direction you move the mouse. You do not need to click the mouse to move the cursors. Each cursor has a current value associated with it that is displayed in the lower left corner of the display. The $X:$ value is the current time value of the horizontal scale, and the $Y:$ value is the current amplitude value of the vertical scale. After selecting this command, when you select the Options Menu again, **Display Cursor** will have a check mark (**J**) to its left. Selecting it again or selecting another cursor will disable the feature.

■ **Waveform Cursor** — Select this menu item by pointing and clicking with the mouse, or by pressing the W keyboard key. **Waveform Cursor** adds a vertical and horizontal waveform cursor to the waveform display. Left and right movement of the mouse controls the vertical cursor. As the vertical cursor moves, the horizontal cursor moves to track the vertical cursor. Each cursor has a current value associated with it that is displayed in the lower left corner of the display. The $x:$ value is the current time value of the cursor position on the waveform, and the $Y:$ value is the current amplitude value of the cursor position on the waveform. After selecting this command, when you select the Options Menu again, **Waveform Cursor** will have a check mark (**J**) to its left. Selecting it again or selecting another cursor will disable the feature.

NOTE

Waveform cursors can only be manipulated with the mouse: there is no keyboard interface.

■   **Amplitude Cursors** — Select this menu item by pointing and clicking with the mouse, or by pressing the A keyboard key. **Amplitude Cursors** adds two horizontal cursors to the waveform display (identified with a boxed number 1 and 2 at the left of the display). You can independently move each cursor by clicking the mouse on the cursor and dragging it to the desired location. Each cursor has a current amplitude value associated with it that is displayed in the lower left corner of the display and identified with a **1:** and 2:. The same value display also includes the Delta value between the cursors, which is identified with a D:. After selecting this command, when you select the Options Menu again, <u>A</u>mplitude Cursors will have a check mark (J) to its left. Selecting it again or selecting another cursor will disable the feature.

<u>Ti</u>me Cursors — Select this menu item by pointing and clicking with the mouse, or by pressing the T keyboard key. <u>Ti</u>me Cursors adds two vertical cursors to the waveform display (identified with a boxed number **1** and 2 at the top of the display. You can independently move each cursor by clicking the mouse on the cursor and dragging it to the desired location. Each cursor has a current time value associated with it that is displayed in the lower left corner of the display and identified with a **1:** and 2:. The same value display also includes the Delta value between the cursors, which is identified with a D: . After selecting this command, when you select the Options Menu again, **Lime Cursors** will have a check mark **(J)**to its left. Selecting it again or selecting another cursor will disable the feature.

Colors and Styles... — Select this menu item by pointing and clicking with the mouse, or by pressing the C keyboard key. **Colors and Styles...** opens the following dialog box, allowing you to select waveform display colors and line styles.
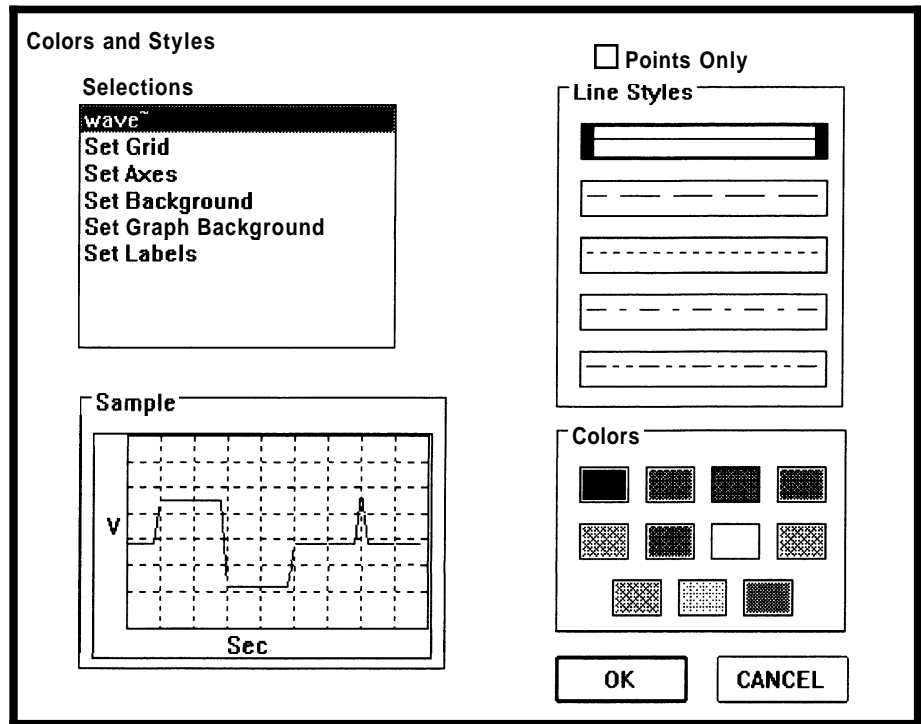
IPG provides the following dialog box items for user interaction:

■ **Selections—** A list box containing a listing of the items whose colors and line styles you can change, as follows:

Waveform Variable names or plotnames
Set Grid and Axes
Set Background
Set Graph Background
Set Labels

■ **Sample—** A display representing the waveform display whose features will change color and line style based on the selections you make in the **Selections** list box.

■ **Points Only** — Selecting this check box causes the selected graph to be plotted with points only instead of lines from point to point.

■ **Line Styles—** A list box containing the different line styles you can select, as follows:

Solid
Long Dash
Short Dash
Long Dash with Single Dot
Long Dash with Double Dot

■ **Colors—** A list box containing the different colors you can select. The available colors are Black, Red, Green, Blue, Yellow, Purple, White, Light Purple, Light Blue, Light Yellow, and Light Green.

■ Labels**...** — Select this menu item by pointing and clicking with the mouse, or by pressing the A keyboard key. Labels**...** opens the following dialog box, allowing you to change the waveform display title and the names of the X and Y Axes.

```
┌─────────────────────────────────────────────┐
│ Label Options                               │
│ Title:    [wfm1 ]                           │
│                                             │
│ X Axis:   [Points       ]                   │
│                                             │
│ Y Axis:   [Volts        ]                   │
│                                             │
│        (    OK    )        (   Cancel   )   │
└─────────────────────────────────────────────┘
```

IPG provides the following dialog box commands for user interaction.

■ Title: — An edit box where you enter a title for the waveform display.

■ X Axis: — An edit box where you enter a name for the horizontal scale.

■ Y Axis: — An edit box where you enter the name of the vertical scale.

■ **OK** — Select this pushbutton to complete the Labels**...** action.

■ Cancel — You can select this pushbutton to cancel the Labels**...**

Section 5
Advanced Applications

Advanced Applications

This section contains detailed information and application tutorials for the advanced features of IPG.

Creating a Test Procedure

In this example, we will create a more complex test procedure than was given in Section 3, Creating and Editing a Test Procedure. The test procedure we will create is identical to the DEMOTEST.PRG procedure supplied on the IPG program disks and listed in Appendix B, *DEMOTEST.PRG* Program. We will create this program step-by-step, explaining the creation and purpose of each step as we go.

You can compare your on-screen test procedure with the OUTLINE printout in Appendix B. The only difference in our procedure and the DEMOTEST procedure will be the name; we will name our procedure MYTEST. (Both the OUTLINE and FULL printouts in Appendix *B* have reference numbers on the left margin of the page. These reference numbers correspond to the number of the tutorial description where that step was created. For example, if the boxed number 1 on the printout is what you want to reference, it refers to *1. Selecting the Instruments.*).

Test Procedure Overview

Assumptions

If you intend to create the following test procedure, it is assumed that the instrumentation in the following Required Hardware description (or the equivalent) is available, and that you know how to set up and operate that instrumentation. It is also assumed that the proper files from the IPG program disks (listed in the following Software description) have been copied from the disk into the directory where the completed test procedure will be stored.

NOTE

If possible, create the following procedure in one session. (It will take you about an hour.) If you do stop in the middle of the procedure and exit, be sure to save your work. When you reopen the procedure, refer to the manual illustration of the last completed step and notice which step in the procedure was highlighted. You will need to highlight this step before continuing, so that the steps will be in the proper order when you complete the procedure. Also, after reopening the file, you may need to open the Instrument Front Panel views by using the Instruments Menu, rather than by using the icons at the bottom of the screen display.

Required Hardware

The following instrumentation is used in this test procedure:

A Tektronix DM5120 Programmable Digital Multimeter (GPIB controlled)

A Tektronix FG5010 20 MHz Function Generator (GPIB controlled)

A Tektronix PS503 Power Supply (User controlled — used to provide power to the unit under test (UUT))

A Tektronix TM5006 Mainframe (required for the DM5010, FG5010, and PS503)

A controller capable of GPIB communications with the instruments

If you choose to use equivalent instrumentation, you will need to provide the proper instrument driver files to replace those supplied on the IPG program disks. If the necessary drivers are not included in the Tektronix Instrument Front Panel Libraries, you will need to write your own drivers. Refer to the Instrument Front Panel Developer's Manual for further information.

Software

The following instrument drivers and bit-mapped picture files are necessary for the creation of the test procedure. These files are included on the IPG program disks. You will need to verify that these files have been copied from the disk, and that they reside in the directory where the test procedure will be stored.

TDM5120.ISD
TDM5120.HLP
TEKFG.ISD
TEKFG.HLP
TEKPIC.BMP

Test Procedure Overview

DEMOTEST.PRG, the test procedure you will create in this section, tests an amplifier with an amplitude control. The test has the operator adjust the control for a particular voltage at a base frequency. It then varies the frequency from 10–100 kHz in 21 logarithmic steps, measuring the voltage at each frequency. Finally, the test procedure reports the results on the screen and logs them into a file named DEMOTESTDAT

1. Selecting the Instruments

You can select the instruments at any time during the creation of the procedure, as long as the selection occurs before the instrument views are used. However, since instrument selection should be part of the test procedure planning process, we will begin with the selection in creating the procedure. This ensures that the instrument drivers will be available for the test procedure when they are needed. You will notice on the test procedure printouts that a list of the selected instruments is printed before the first procedure step.

NOTE

The instrument primary GPIB addresses given in these procedures are the factory defaults. If you have changed these addresses, you will need to enter the correct address during the procedures, rather than the default given.

Begin the instrument selection by selecting **Instruments** from the Main Menu bar. When the Instruments Menu appears, select **Select....** After the Instruments Select dialog box appears, perform the following steps:

a. Select the TDM512 0.ISD file by pointing and double-clicking the mouse on it in the drive/directory/file list box. When the file name appears in the **Drivers:** edit box, ensure that GPIB0 is selected in the **Port:** edit box. If GPIB0 is not selected, point and click the mouse on it. Then enter the factory default GPIB address of 16 in the **Primary:** edit box and dmm in the TMS **Name:** edit box. Do not make any entry in the **Secondary:** address box (this is used only when the instrument has a secondary GPIB address). If any errors occur during the loading of the instrument driver, appropriate error messages will be displayed. Before continuing to the next step, make certain that you screen display matches the following illustration.

b. Select the **Add** pushbutton.

c. Next, select the TEKFG.ISD file by pointing and double-clicking the mouse on the name in the drive/directory/file list box. When the file name appears in the **Drivers:** edit box, ensure that GPIB0 is selected in the **Port:** edit box. If GPIB0 is not selected, point and click the mouse on it. Then enter the factory default GPIB address of 24 in the **Primary:** edit box and fg in the **TMS Name:** edit box. Select the **Add** pushbutton and verify that the display matches the following illustration.

d. Select the **OK** pushbutton to complete the instrument driver selection process and return to the Main Menu. To confirm that the instrument selection has taken place, select **Instruments,** then select **View.** Your display should match the following illustration. After verifying your selections, select **Cancel.**

2. Entering the First Remark

Perform the following to create the first test procedure step `REMARK`:

a. Select Actions from the Main Menu bar.

b. When the Actions Menu appears, select **Remark....**

c. After the Remark dialog box appears, perform the following:

> Enter the words `Locate Gain Adj R3 and preset it.`in the edit box. Your display should match the following illustration

```
┌─────────────────────────────────────────────────────────────┐
│                          REMARK                               │
│ Edit                                                          │
├───────────────────────────────────────────────────────────┬─┤
│                                                             │↑│
│ Locate Gain Adj R3 and preset it.                           │ │
│                                                             │ │
│                                                             │ │
│                                                             │↓│
│ ←                                                         → │ │
├───────────────────────────────────────────────────────────┴─┤
│          ┌──────────┐              ┌──────────┐              │
│          │    OK    │              │  Cancel  │              │
│          └──────────┘              └──────────┘              │
└───────────────────────────────────────────────────────────────┘
```
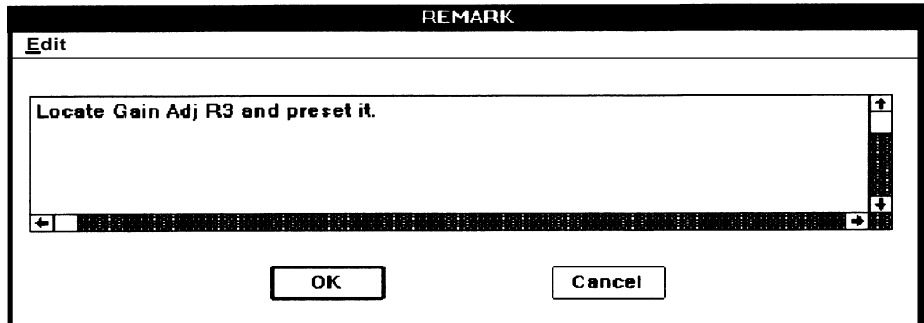
■ Select the **OK** pushbutton to create the step and return to the Main Menu. The `REMARK` Step will appear in the display. Since this is the first test procedure step to appear on the display, a `PROCEDURE (Untitled)()` line will appear at the beginning of the procedure and an `END-PROCEDURE` line will appear after the `REMARK`. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬              TekTMS/IPG - (untitled)                      ▼ ▲  │
├───────────────────────────────────────────────────────────────────┤
│  File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│  Translate                                                F1=Help │
├───────────────────────────────────────────────────────────────────┤
│ PROCEDURE (untitled) [ ]                                          │
│ REMARK Locate Gain Adj R3 and preset it.                          │
│ END  PROCEDURE                                                    │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
└───────────────────────────────────────────────────────────────────┘
```
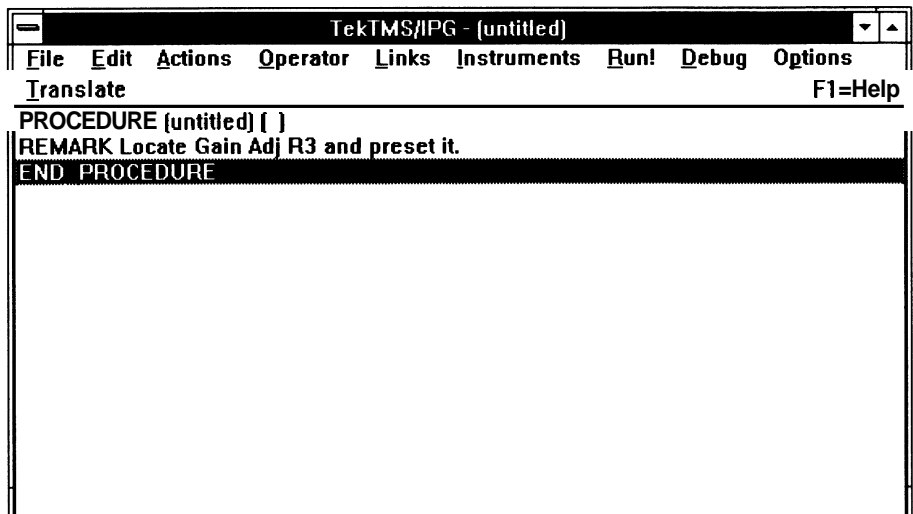
3. Naming the Procedure

So far, we have not saved the procedure, so the procedure statement shows `PROCEDURE (untitled) ()`, and the window Title Bar at the top of the display shows `TekTMS — (untitled)`, indicating that no file name has been assigned.

A test procedure is named when you save it, which can be done any time after you have created at least one step. The file name assigned to it becomes the name of the test procedure.

NOTE

When using a GPIB Interface Card in a Personal Computer or Workstation to control GPIB instrumentation, users need to be aware of certain filenames that should not be used for Test Procedures (files with .PRG extensions), or for Instrument Front Panel drivers (files with *.ISD* extensions). For additional information see the File Names topic in Section 2, Getting Started.

Perform the following steps to name the test procedure:

a. Select **File** from the Main Menu bar.

b. When the File Menu appears, select the **Save as...** menu item, causing the Save As dialog box to appear. Then enter `MYTEST` in the **Save file as:** edit box (you do not need to enter a file extension, since IPG automatically adds a .PRG extension). Your display should match the following illustration.

```
Save file as:                          c:\ipg
┌─────────────────────────────────┐
│ MYTEST                          │
└─────────────────────────────────┘
Edit Key:
┌─────────────────────┐   ┌──────────┐
│                     │   │  Save    │
└─────────────────────┘   └──────────┘
  n key:
┌─────────────────────┐   ┌──────────┐
│                     │   │  Cancel  │
└─────────────────────┘   └──────────┘
```
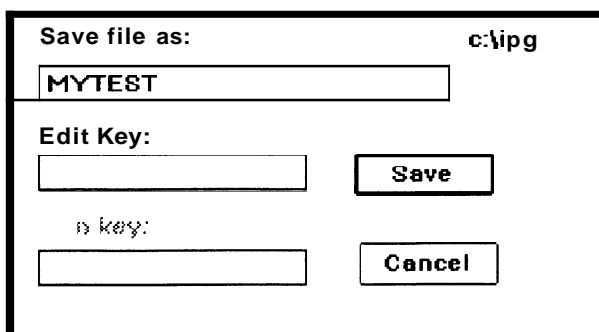
c. Select the **Save** pushbutton to create the step and return to the Main Menu. The file name will appear as the title in the previously (untitled) window Title Bar at the top of the display, and in the previously (untitled) `PROCEDURE` statement in the display. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬              TekTMS/IPG - MYTEST.PRG                         ▼ ▲    │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                      F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE MYTEST │ │                                                   │
│ REMARK Locate Gain Adj R3 and preset it                               │
│ END-PROCEDURE                                                         │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```
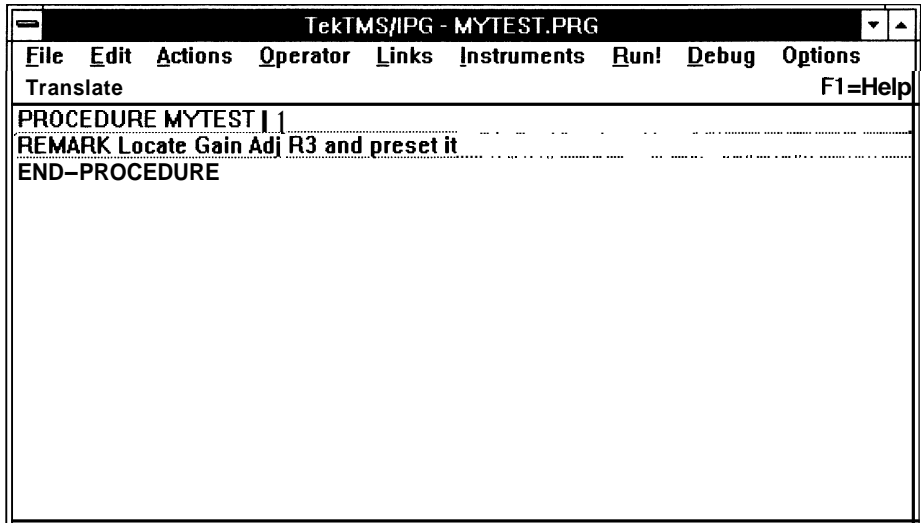
4. Adding Operator Prompts

A Picture Prompt — You can enter an operator prompt step in the
form of a picture anywhere in the procedure. This picture must have
been created, scanned, or captured in a bit-mapped format that can be
read into a Windows environment.

Perform the following to create a `Picture Prompt` step in your test
procedure:

a. Select **Qperator** from the Main Menu bar. When the Operator Menu
    appears, select the **Prompt** menu item. After the Prompt menu list
    appears, select Picture

b. After the Picture Prompt dialog box appears, select **File**. When the
    File menu appears, select the **Load...** menu item.

c. When the Picture File Selection dialog box appears, enter TEK-
    PIC.BMP in the **Picture Name:** edit box. TEKPIC.BMP is the name of
    the sample file provided with the IPG containing the picture to be
    loaded. Verify that your display matches the following illustration,
    then select the **Load** pushbutton.
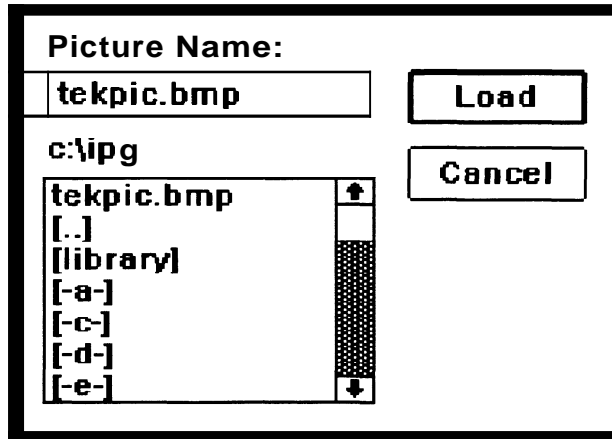
d. When the picture shown in the following illustration appears in the Picture Prompt dialog box, select **File**.
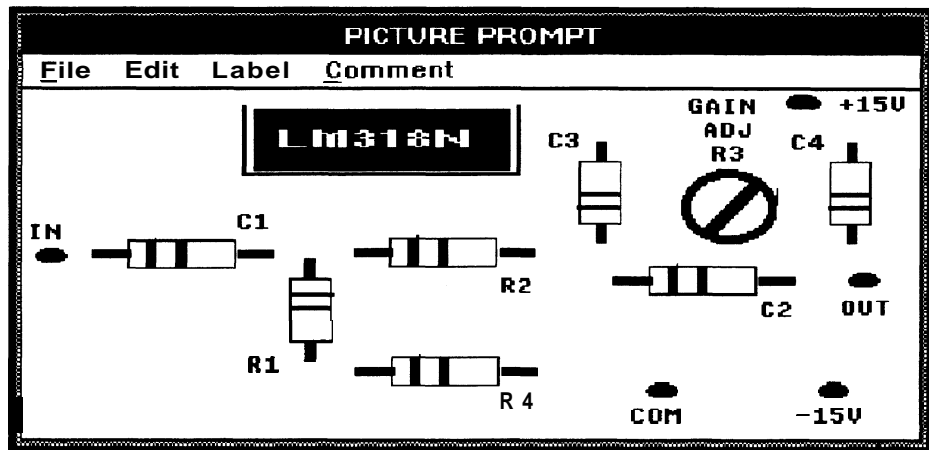
NOTE

Refer to Section 5, Menus, Operator Menu, **Prompt, Picture...** for more information about using .BMP files.

e. After the File menu appears, select the **Save and Exit...** menu item to create the step and return to the Main Menu. Your display should now match the following illustration.

```
┌─────────────────────────────────────────────────────────────────┐
│ ━  ▭         TekTMS/IPG - MYTEST.PRG              ▼ ▲              │
├─────────────────────────────────────────────────────────────────┤
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate                                                    F1=Help │
├─────────────────────────────────────────────────────────────────┤
│ PROCEDURE MYTEST ( )                                              │
│ REMARK Locate Gain Adj R3 and preset it.                          │
│  PROMPT PICTURE tekpic.bmp                                        │
│ END  PROCEDURE                                                    │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```
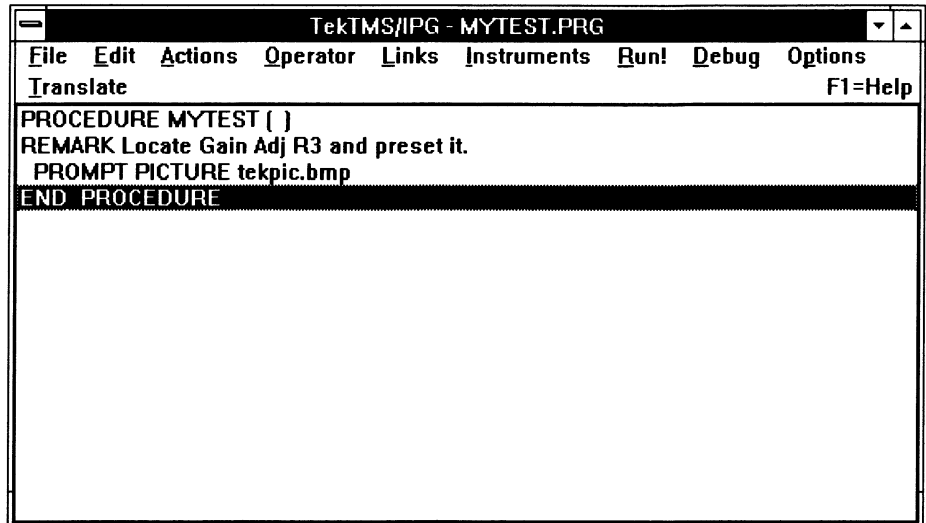
Text Prompt — You can enter an operator prompt step in the form of text anywhere in the procedure.

Perform the following to create a `Text Prompt` Step in our test procedure:

f.   Select **Operator** from the Main Menu bar. When the Operator Menu appears, select the **Prompt** menu item. After the Prompt menu list appears, select **Text.**

g.   When the Text Prompt dialog box appears, enter `Set R3 Gain Adj to midrange.` in the **Message:** edit box. Leave the **Variable:** edit box blank. Verify that your display matches the illustration below, then select the **OK** pushbutton to create the step and return to the Main Menu.

```
┌─────────────────────────────────────────────────────────────────┐
│                          TEXT PROMPT                              │
├─────────────────────────────────────────────────────────────────┤
│  Edit   Label   Comment                                           │
├─────────────────────────────────────────────────────────────────┤
│ Massage:                                                          │
│ ┌─────────────────────────────────────────────────────────┬──┐  │
│ │ Set R3 Gain Adj to midrange.                             │▲ │  │
│ │                                                          │  │  │
│ │                                                          │  │  │
│ │                                                          │  │  │
│ │                                                          │  │  │
│ │                                                          │▼ │  │
│ ├──┬──────────────────────────────────────────────────┬──┼──┤  │
│ │◄ │                                                    │► │  │
│ └──┴──────────────────────────────────────────────────┴──┘     │
│ Variable:     ┌──────────────────────────────┐                  │
│               └──────────────────────────────┘                  │
│                   ┌──────────┐      ┌──────────┐                 │
│                   │    OK    │      │  Cancel  │                 │
│                   └──────────┘      └──────────┘                 │
└─────────────────────────────────────────────────────────────────┘
```

h.   Verify that your display matches the illustration below.

```
─                    TekTMS/IPG - MYTEST.PRG                    ▼ ▲
 File   Edit   Actions   Operator   Links   Instruments   Bun!   Debug   Options
 Translate                                                         F1=Help
 PROCEDURE M M E S T [ ]
 REMARK Locate Gain Adj R3 and preset it.
   PROMPT PICTURE tekpic.bmp
   PROMPT Set R3 Gain Adj to midrange.
 END_PROCEDURE
```
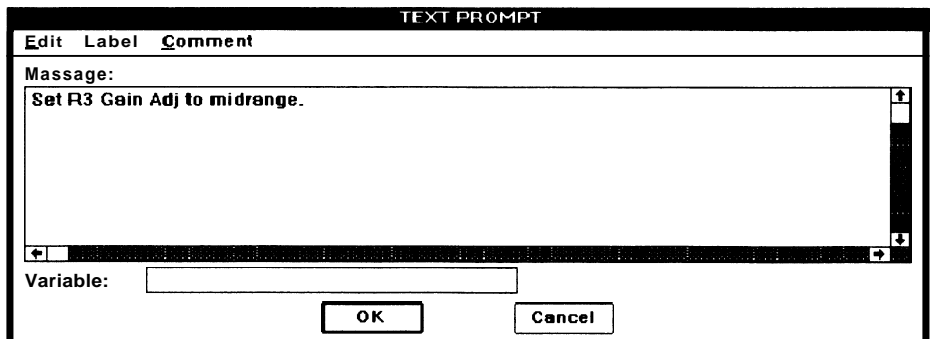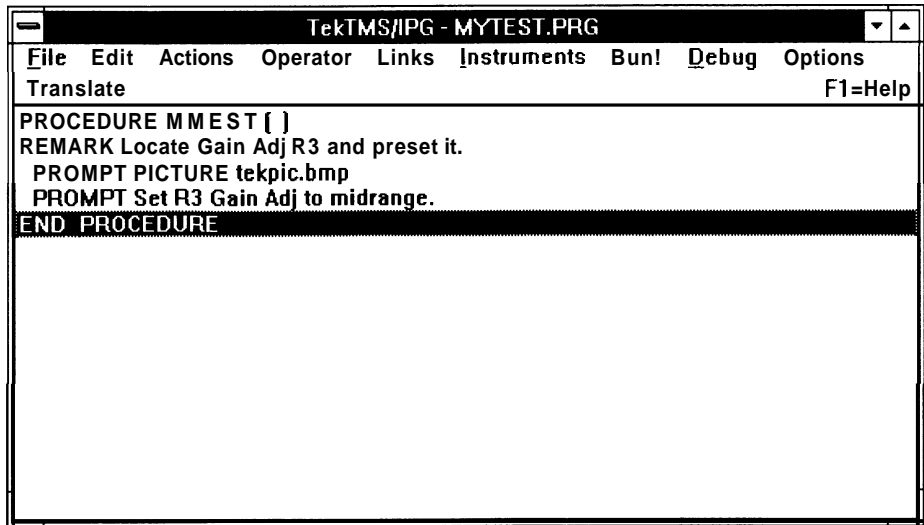
5. Entering the Second Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the *First* Remark. The only difference is that you will enter `Initialize instruments for tests to follow.` for the REMARK text. When you have completed entering the REMARK, selected the **OK** pushbutton, and returned to the Main Menu, your display should match the following illustration.

```
─                    TekTMS/IPG - MYTEST.PRG                    ▼ ▲
 File   Edit   Actions   Qperator   Links   Instruments   Bun!   Debug   Options
 Translate                                                         F1=Help
 PROCEDURE M M E S T [ ]
 REMARK Locate Gain Adj R3 and preset it.
   PROMPT PICTURE tekpic.bmp
   PROMPT Set R3 Gain Adj to midrange.
 REMARK Initialize instruments for tests to follow.
 END_PROCEDURE
```
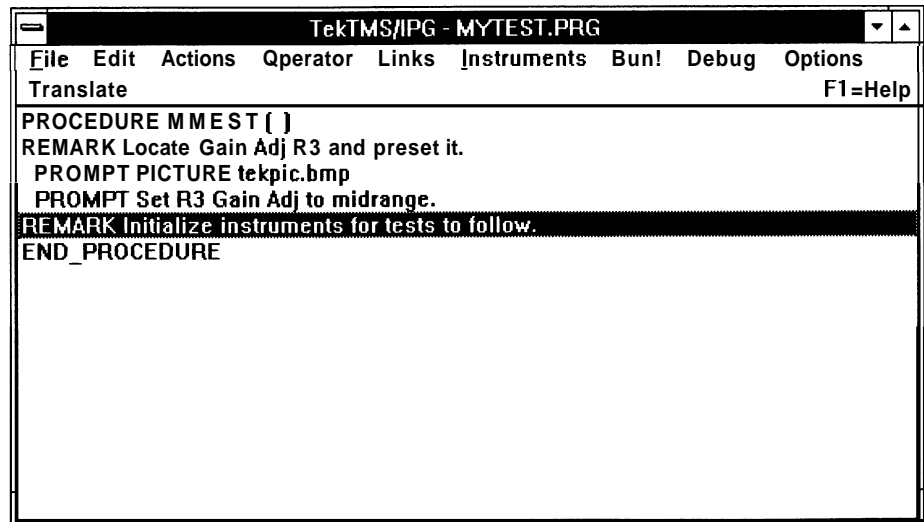
6. Setting the Instruments

To create SETT ■NG steps, the instrument drivers (files with an .ISD extension) for the specific instruments must be available in the directory where the procedure is to be saved.

Setting the Function Generator — Perform the following to create a SETT ■NG step for the Function Generator (FG5010):

a. Open the function generator (TEKFG.ISD) Instrument Front Panel view by selecting **Instruments** from the Main Menu bar. When the Instruments Menu appears, select the **View...** menu item. After the Instruments Front Panel dialog box appears, select the TEKFG.ISD (fg) instrument from the list box, then select the **OK** pushbutton.

NOTE

You may need to *resize* the window to see the entire instrument front panel view.

b. Select the **SINE WAVE** radiobutton; select the **OUTPUT** check box; enter 1000 in the **FREQUENCY** edit box; select the **CONTINUOUS** check box; and select **1** in the **AMPLITUDE** list box. Verify that your display matches the following illustration.
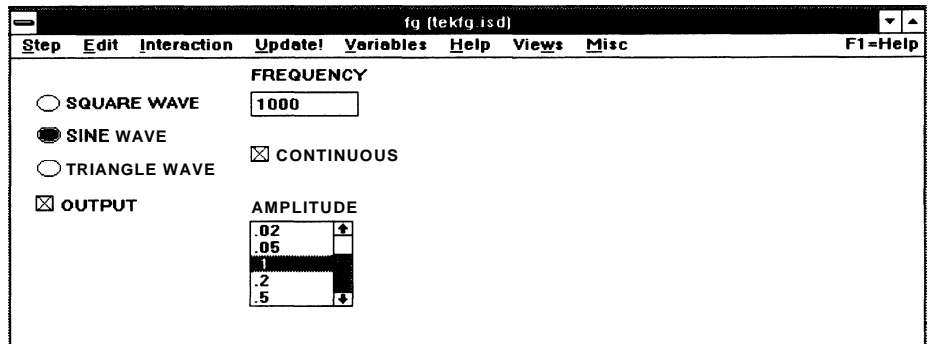
c. Select **Step.** When the Step Menu appears, select **Saye Selected Settings....** After the Selected Settings dialog appears, select the following **Control List** names, in order, and select the **Add** pushbutton after each **Control List** item. The order of the controls in the **Selected Control** edit box is the order in which they will be executed, beginning at the top of the list. This will place the selected **Control List** names in the Selected Control edit box.

**SINEWAVE
FREQUENCY
CONTINUOUS
AMPLITUDE
OUTPUT**

d. Verify that your display matches the following illustration, then select the **OK** pushbutton.
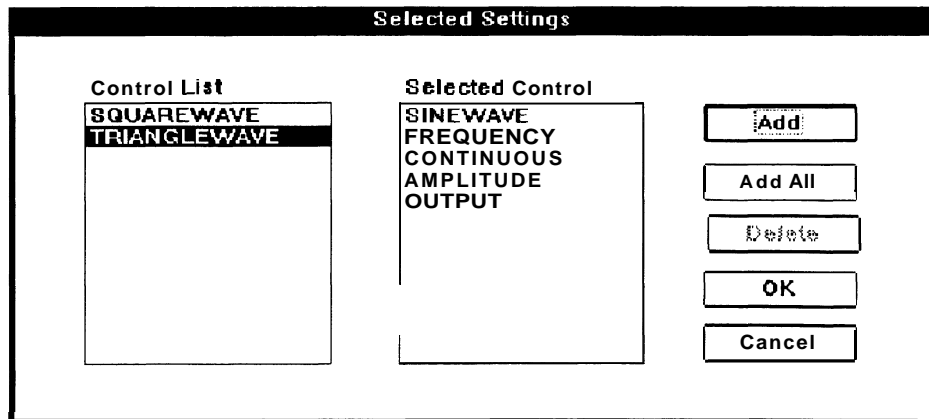
e. When the front panel view reappears, minimize it by selecting the down-arrow (↓) in the upper right corner of the window. This will keep the front panel opened, but reduce it to an active icon at the bottom of the display. It also will return to the test procedure outline display and the Main Menu. Your display should now match the following illustration.
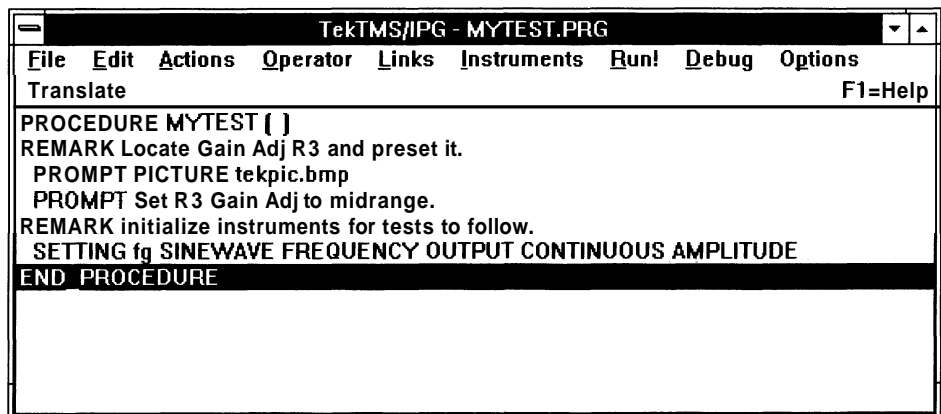
Setting the Digital Multimeter — The SETT ■NG step for the Digital Multimeter (DM5120) is created in exactly the same manner as the SETT ■NG step for the Function Generator.

Perform the same actions you used to create the SETT ■NG step for the Function Generator, with the following exceptions:

f. After the Instruments Front Panel dialog box appears, select the TDM5120.ISD (dmm) instrument from the list box, then select the **OK** pushbutton.

You may need to *resize* the window to see the entire instrument front panel view.

g. After the Instrument Front Panel view and menu appear, select the 3 **Digits** radiobutton from the **ACCURACY** group box, then select 30 **V** from the **RANGE** list box. Verify that your display matches the following illustration.
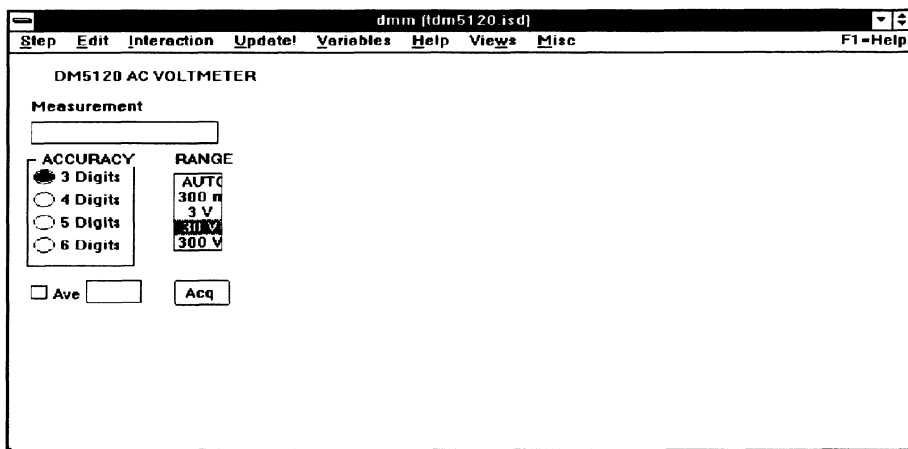
h. Select **Step.** When the Step Menu appears, select **Save Selected Settings....** After the Selected Settings dialog box appears, select each of the following **Control List** names (in the order shown), and select the **Add** pushbutton after each **Control List** item. This will place the selected **Control List** names in the **Selected Control** edit box.

acvthree
acvrange

i. Verify that your display matches the following illustration, then select the **OK** pushbutton.

j. When the front panel view reappears, minimize it by selecting the down-arrow (↓) in the upper right corner of the window. This will keep the front panel opened, but reduce it to an active icon at the bottom of the display. It also will return to the test procedure outline display and the Main Menu. Your display should now match the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▬          TekTMS/IPG - MYTEST.PRG                          ▼ ▲ │
├──────────────────────────────────────────────────────────────────────┤
│  File   Edit   Actions   Qperator   Links   Instruments   Bun!   Debug   Options │
│ Translate                                                      F1=Help │
├──────────────────────────────────────────────────────────────────────┤
│ PROCEDURE MMEST ( )                                                    │
│ REMARK Locate Gain Adj R3 and preset it.                               │
│   PROMPT PICTURE tekpic.bmp                                            │
│   PROMPT Set R3 Gain Adj to midrange.                                  │
│ REMARK Initialize instruments for tests to follow.                     │
│   SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE            │
│   SETTING dmm acvrange acvthree                                        │
│ END PROCEDURE                                                          │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```

7. Entering the Third Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter `Adjust R3 Gain Adj to its nominal value.` for the REMARK text. When you have completed entering the REMARK, selected the **OK** pushbutton, and returned to the Main Menu, your display should match the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▬          TekTMS/IPG - MYTEST.PRG                          ▼ ▲ │
├──────────────────────────────────────────────────────────────────────┤
│  File   Edit   Actions   Qperator   Links   Instruments   Bun!   Debug   Options │
│ Translate                                                      F1=Help │
├──────────────────────────────────────────────────────────────────────┤
│ PROCEDURE MYTEST ( )                                                   │
│ REMARK Locate Gain Adj R3 and preset it.                               │
│   PROMPT PICTURE tekpic.bmp                                            │
│   PROMPT Set R3 Gain Adj to midrange.                                  │
│ REMARK Initialize instruments for tests to follow.                     │
│   SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE            │
│   SE'ITING dmm acvrange acvthree                                       │
│ REMARK Adjust R3 Gain to its nominal value.                            │
│ END PROCEDURE                                                          │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```

8. Adding an Adjustment Step

An `ADJUSTMENT` step creates an adjust-measure-display interactive loop step starting at an `ADJUSTMENT` statement and ending at an `END-ADJUSTMENT` statement. Perform the following to create an `ADJUSTMENT` step:

a. Select **Operator** from the Main Menu bar. When the Operator Menu appears, select the **Adjustment..** menu item. After the **Adjustment** dialog box appears, enter 3 in the **Lower Limit:** edit box, **3.6** in the **Nominal Value:** edit box, and **4** in the **Upper Limit:** edit box.

b. Enter `gaincal` in the **Variable:** edit box. This is the variable name where the value measured at the output of the Gain Amplifier is stored. Next, click the mouse on the **Message:** edit box and enter `Adjust R3 to its nominal value.` This message will appear on-screen for the operator during procedure runtime. Verify that your display matches the following illustration.

c. Select the **OK** pushbutton to create the step and return to the Main Menu. Your display should now match the following illustration.

9. Taking Measurements

MEASUREMENT steps, like SETTING steps, require the instrument drivers (files with an .ISD extension) for the specific instruments to be available in the directory where the procedure is to be saved.

This measurement step must be part of the ADJUSTMENT/END_AD-JUSTMENT construct; however, the current display cursor location is at the highlighted END-PROCEDURE statement. Since steps are entered immediately above a highlighted step, you must point and click the mouse on the END-ADJUSTMENT statement. This changes the location at which the next step will be inserted.

Perform the following to add the MEASUREMENT step:

a. Point and double-click the mouse on the dmm icon at the bottom of the display. (If you have saved and exited the procedure since creating the SETTING steps, the icon will not be available. In this case, select Instruments from the Main Menu. When the Instruments Menu appears, select the View... menu item. After the Instruments Front Panel dialog box appears, highlight the TDM5120.ISD instrument in the list box and select **OK.**)

b. When the front panel view and menu appears, click on the Measurement edit box. This will make Measurement the currently selected control, and will place a blinking cursor in the edit box, as shown in the following illustration.
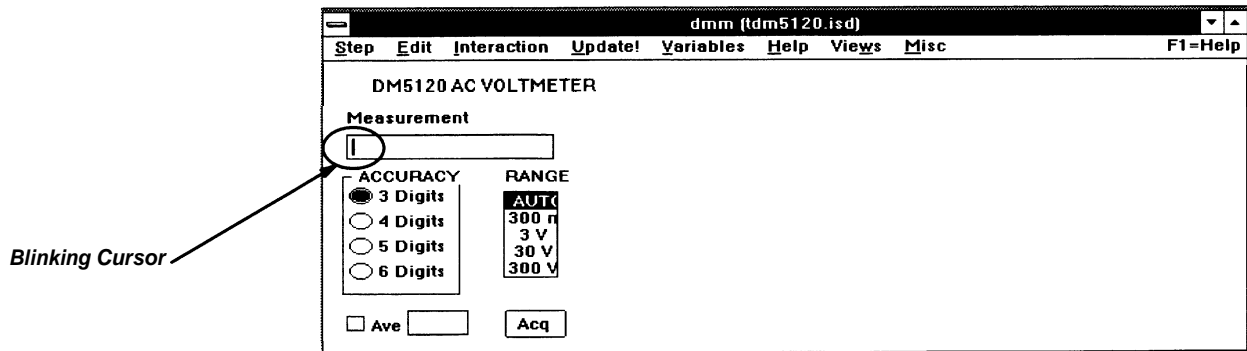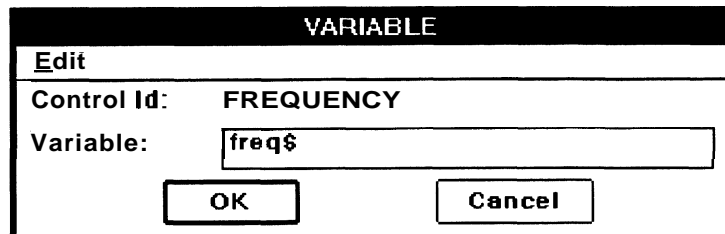

c. Select Variables from the front panel menu. When the Variables Menu appears, select the Current Control... menu item. After the Variable dialog box appears, enter gaincal in the Variable: edit box.

NOTE

It is important that the variable name (in this case, `gaincal`*) associated with the selected instrument control be the same as the name of the* `ADJUSTMENT` *loop. If the names are not the same, the* `ADJUSTMENT` *loop will not have a value. If you do not perform steps 9c. and 9d. correctly, you may have a different name for the variable. If you do not assign a variable name, IPG will create its own name of the form '*`ι`*TMSname.controlTYPE', where the name starts with '*`ι`*', followed by the TMS name of the instrument, then a period, then the control name, followed by the variable type (string, float, etc.) The assignment of variable names to front panel controls is how IPG is able to return a measurement for a specified control. Refer to the illustration in Step e. to see where the variable and loop names appear in the program.*

Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────┐
│                   VARIABLE                       │
├─────────────────────────────────────────────────┤
│  Edit                                            │
├─────────────────────────────────────────────────┤
│  Control Id:    acvreading                       │
│                                                  │
│  Variable:    ┌─────────────────────────────┐    │
│               │ gaincal                     │    │
│               └─────────────────────────────┘    │
│        ┌──────────────┐      ┌──────────────┐    │
│        │     OK       │      │   Cancel     │    │
│        └──────────────┘      └──────────────┘    │
└─────────────────────────────────────────────────┘
```

d. *Select the* **OK** *pushbutton to assign the variable and return to the front panel view. After the front panel view returns, select* **Step.** *When the Step Menu appears, select the* **Save Selected Measurements...** *menu item. After the Selected Measurements dialog box appears, select* **acvreading** *from the* **Control List** *list box, then the* **Add** *pushbutton. Verify that your display matches the following illustration.*

```
┌──────────────────────────────────────────────────────────────┐
│                   Selected Measurements                       │
├──────────────────────────────────────────────────────────────┤
│                                                               │
│   Control List            Selected Control                    │
│  ┌───────────────┐       ┌──────────────────┐  ┌──────────┐   │
│  │ acvthree      │       │ acvreading       │  │  iAddi   │   │
│  │ acvfour       │       │                  │  └──────────┘   │
│  │ acvfive       │       │                  │  ┌──────────┐   │
│  │ acvsix        │       │                  │  │  Add All │   │
│  │ acvfilt ...   │       │                  │  └──────────┘   │
│  │ acvrange      │       │                  │  ┌──────────┐   │
│  │               │       │                  │  │  Delete  │   │
│  │               │       │                  │  └──────────┘   │
│  │               │       │                  │  ┌──────────┐   │
│  │               │       │                  │  │    OK    │   │
│  │               │       │                  │  └──────────┘   │
│  │               │       │                  │  ┌──────────┐   │
│  └───────────────┘       └──────────────────┘  │  Cancel  │   │
│                                                 └──────────┘   │
└──────────────────────────────────────────────────────────────┘
```

e. Select the OK pushbutton to create the step and return to the front panel view. When the front panel view reappears, minimize it by selecting the down-arrow (↓) in the upper right corner of the window. Point and click the mouse on the END–PROCEDURE step to highlight it. Your display should now match the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ⬛           TekTMS/IPG - MYTEST.PRG                          ▼ ▲     │
├─────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                    F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE M M E S T [ ]                                              │
│ REMARK Locate Gain Adj R3 and preset it.                            │
│  PROMPT PICTURE tekpic.bmp                                          │
│  PROMPT Set R3 Gain Adj to midrange.                               │
│ REMARK Initialize instruments for tests to follow.                 │
│   SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE         │
│   SETTING dmm acvrange acvthree                                    │
│ REMARK Adjust R3 Gain to its nominal value.                        │
│   ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                       │
│    MEASUREMENT dmm acvreading gaincal                              │
│   ███ END_ADJUSTMENT ██████████████████████████████████            │
│ END_PROCEDURE                                                      │
│                                                                     │
│                                                                     │
└─────────────────────────────────────────────────────────────────────┘
```

These names must match

10. Entering the Fourth Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter Initialize test procedure variables. for the REMARK text. When you have completed entering the REMARK, selected the OK pushbutton, and returned to the Main Menu, your display should match the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ⬛           TekTMS/IPG - MYTEST.PRG                          ▼ ▲     │
├─────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                    F1=Help │
├─────────────────────────────────────────────────────────────────────┤
│ PROCEDURE MYTEST [ ]                                                │
│ REMARK Locate Gain Adj R3 and preset it.                           │
│  PROMPT PICTURE tekpic.bmp                                         │
│  PROMPT Set R3 Gain Adj to midrange.                              │
│ REMARK Initialize instruments for tests to follow.                │
│   SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE        │
│   SETTING dmm acvrange acvthree                                   │
│ REMARK Adjust R3 Gain to its nominal value.                       │
│   ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                      │
│    MEASUREMENT dmm acvreading:gaincal                             │
│   END_ADJUSTMENT                                                   │
│ REMARK Initialize test procedure variables.                       │
│ ███ END_PROCEDURE ████████████████████████████████████            │
│                                                                     │
└─────────────────────────────────────────────────────────────────────┘
```
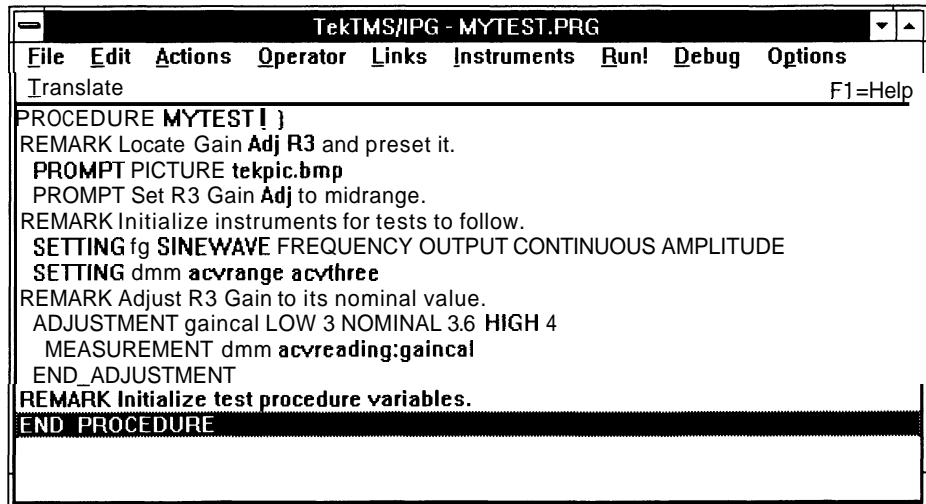
11. Assign and Initialize the Test Variables

The next three steps in our test procedure use the **Calculate** menu item from the Actions Menu to assign names to test procedure variables and initialize those variables.

Perform the following to create a `CALCULATE` step:

a.   Select **Actions** from the Main Menu bar. When the Actions Menu appears, select the **Calculate...** menu item.

b.   After the Calculate dialog box appears, click the mouse on the **Variable:** edit box and enter `index&`. (The last character in the name (&) indicates an integer variable type.) Click the mouse on the **Expression:** edit box and enter `0`. This sets the initial value of the variable `index&`. Verify that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────────┐
│                        CALCULATE                           │
│ Edit  Label  Comment                                       │
│                                                            │
│ Variable:                    Expression:                   │
│ ┌────────────────────┐      ┌─────────────────────────┐   │
│ │index&              │  =  │0                        │   │
│ └────────────────────┘      └─────────────────────────┘   │
│             ┌──────────────┐      ┌──────────────┐         │
│             │     OK       │      │   Cancel     │         │
│             └──────────────┘      └──────────────┘         │
└──────────────────────────────────────────────────────────┘
```

c.   Select the **OK** pushbutton to create the step, assign and initialize the variable, and return to the Main Menu. Verify that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────────┐
│ ▬        TekTMS/IPG - MYTEST.PRG                    ▼ ▲   │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                          F1=Help │
├──────────────────────────────────────────────────────────┤
│ PROCEDURE MMEST [ ]                                        │
│ REMARK Locate Gain Adj R3 and preset it.                   │
│   PROMPT PICTURE tekpic.bmp                                │
│   PROMPT Set R3 Gain Adj to midrange.                      │
│ REMARK Initialize instruments for tests to follow.         │
│   SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE │
│   SETTING dmm acvrange acvthree                            │
│ REMARK Adjust R3 Gain to its nominal value.                │
│   ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4              │
│     MEASUREMENT dmm acvreading:gaincal                     │
│   END-ADJUSTMENT                                           │
│ REMARK Initialize test procedure variables.               │
│   CALCULATE index& = 0                                     │
│ END PROCED▮                                                │
│                                                            │
└──────────────────────────────────────────────────────────┘
```

d.   Repeat Steps a and b, but enter `testdatetime$` in the **Variable:** edit box. (The last character in the name ($) indicates a string variable type.) Enter `date$()+"    "+time$()` in the **Expression:** edit box. This sets the initial value of the variable `testdatetime$`. Verify that your display matches the following illustration.

time$(), date$(), and *chr#()* are built in IPG functions.

CALCULATE

<u>E</u>dit   **Label**   **Comment**

Variable:

testdatetime$ =   date$()+" "+time$()

[OK]   [Cancel]

---

   e.   Select the **OK** pushbutton to create the step, assign and initialize the variable, and return to the Main Menu. Verify that your display matches the following illustration.

TekTMS/IPG - MYTEST.PRG
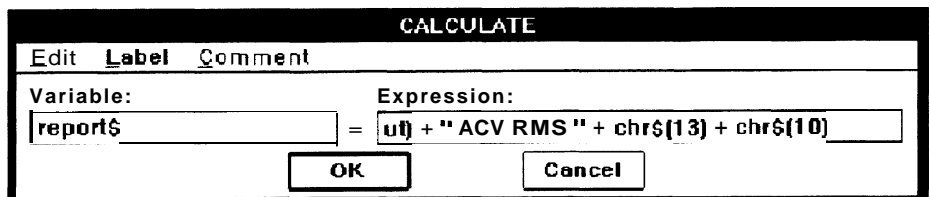
<u>F</u>ile   <u>E</u>dit   <u>A</u>ctions   <u>O</u>perator   **Links**   **Instruments**   <u>R</u>un!   <u>D</u>ebug   O<u>p</u>tions

Translate   F1=Help

```
PROCEDURE MYTEST ( )
REMARK Locate Gain Adj R3 and preset it.
 PROMPT PICTURE tekpic.bmp
 PROMPT Set R3 Gain Adj to midrange.
REMARK Initialize instruments for tests to follow.
  SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE
  SETTING dmm acvrange acvthree
REMARK Adjust R3 Gain to its nominal value.
 ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4
   MEASUREMENT dmm acvreading:gaincal
 END-ADJUSTMENT
REMARK Initialize test procedure variables.
  CALCULATE index& = 0
  CALCULATE testdatetime$ = date$()+time$()
END PROCEDURE
```

---

   f.   Repeat Steps a and b, but enter r e p o r t $ in the **Variable:** edit box. (The last character in the name ($) indicates a string variable type.) Enter `testdatetime$+chr$(13)+chr$(10)` in the **Expression:** edit box. This sets the initial value of the variable report$. Verify that your display matches the following illustration.

CALCULATE

<u>E</u>dit   **Label**   **Comment**

Variable:

report$ =   testdatetime$+chr$(13)+chr$(10)

[OK]   [Cancel]

---

g. Select the **OK** pushbutton to create the step, assign and initialize the variable, and return to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ⊟            TekTMS/IPG - MYTEST.PRG                              ▼ ▲ │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                          F1=Help │
├─────────────────────────────────────────────────────────────────────────┤
│REMARK Locate Gain Adj R3 and preset it.                                 ♦ │
│ PROMPT PICTURE tekpic.bmp                                                 │
│ PROMPT Set R3 Gain Adj to midrange.                                       │
│REMARK initialize instruments for tests to follow.                         │
│ SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE                  │
│ SETTING dmm acvrange acvthree                                             │
│REMARK Adjust R3 Gain to its nominal value.                                │
│ ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                                │
│  MEASUREMENT dmm acvreading:gaincal                                       │
│ END-ADJUSTMENT                                                            │
│REMARK Initialize test procedure variables.                                │
│ CALCULATE index& = 0                                                      │
│ CALCULATE testdatetime$ = date$()+time$()                                 │
│ CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)                       │
│END PROCEDURE                                                            ♦ │
└─────────────────────────────────────────────────────────────────────────┘
```

12. Entering the Fifth Remark

The procedure for entering this REMARK is identical to that used in *Step 2, Entering the First Remark.* The only difference is that you will enter `Initialize test procedure variables.` for the REMARK text. When you have completed entering the REMARK, selected the **OK** push-button, and returned to the Main Menu, your display should match the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ⊟            TekTMS/IPG - MYTEST.PRG                              ▼ ▲ │
│ File   Edit   Actions   Operator   Links   Instruments   Bun!   Debug   Options │
│ Translate                                                          F1=Help │
├─────────────────────────────────────────────────────────────────────────┤
│ PROMPT PICTURE tekpic.bmp                                               ♦ │
│ PROMPT Set R3 Gain Adj to midrange.                                       │
│REMARK Initialize instruments for tests to follow.                         │
│ SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE                  │
│ SETTING dmm acvrange acvthree                                             │
│REMARK Adjust R3 Gain to its nominal value.                                │
│ ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                                │
│  MEASUREMENT dmm acvreading:gaincal                                       │
│ END-ADJUSTMENT                                                            │
│REMARK Initialize test procedure variables.                                │
│ CALCULATE index& = 0                                                      │
│ CALCULATE testdatetime$ = date$()+time$()                                 │
│ CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)                       │
│REMARK Test the frequency response from 10Hz to 100kHz.                    │
│END PROCEDURE                                                            ♦ │
└─────────────────────────────────────────────────────────────────────────┘
```

13. Creating a FOR-NEXT Loop

When you create a basic FOR-NEXT loop step, an opening FOR statement and an ending NEXT statement are displayed in the procedure. You must create any test procedure steps that need to execute within the FOR-NEXT loop between these two statements. Our test procedure will contain two REMARK steps, two Calculate steps, one SETTING step, one DELAY step, and one MEASUREMENT step within the FOR-NEXT loop.

Perform the following to create the basic FOR-NEXT loop step:

a. Select **Actions** from the Main Menu bar. When the Actions Menu appears, select the **For Next** menu item. After the For Next Menu appears, select the **Log** menu item.

b. When the For Next Log dialog box appears: click the mouse on the **Variable:** edit box and enter freq; click the mouse on the **Start Value:** edit box and enter 10 ;click on the **End Value:** edit box and enter 1.0E+5; and click on the **Number of Steps:** edit box and enter 21. Verify that your display matches the following illustration.

c. Select the **OK** pushbutton to create the basic FOR-NEXT loop and return to the Main Menu. Click the mouse on the NEXT statement to highlight it. Before proceeding to the next step, verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ⊟              TekTMS/IPG - MYTEST.PRG                              ▼ ▲   │
├───────────────────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                           F1=Help │
├───────────────────────────────────────────────────────────────────────────┤
│ REMARK Initialize instruments for tests to follow.                     ↑  │
│  SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE                 │
│  SETTING drnm acvrange acvthree                                           │
│ REMARK Adjust R3 Gain to its nominal value.                               │
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                              │
│    MEASUREMENT drnm acvreading:gaincal                                    │
│  END-ADJUSTMENT                                                           │
│ REMARK Initialize test procedure variables.                              │
│  CALCULATE index& = 0                                                     │
│  CALCULATE testdatetime$ = date$[]+time$[]                                │
│  CALCULATE report$ = testdatetime$+chr$[13]+chr$[10]                      │
│ REMARK Test the frequency response from 10Hz to 100kHz.                   │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                                     │
│  NEXT                                                                     │
│ END PROCEDURE                                                          ↓  │
└───────────────────────────────────────────────────────────────────────────┘
```

14. Entering the Sixth Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter `Initialize test procedure variables.` for the REMARK text. When you have completed entering the REMARK, selected the **OK** push-button, and returned to the Main: Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ⊟              TekTMS/IPG - MYTEST.PRG                              ▼ ▲   │
├───────────────────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                           F1=Help │
├───────────────────────────────────────────────────────────────────────────┤
│  SETTING fg SINEWAVE FREQUENCY OUTPUT CONTINUOUS AMPLITUDE             ↑  │
│  SETTING drnm acvrange acvthree                                           │
│ REMARK Adjust R3 Gain to its nominal value.                               │
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4                              │
│    MEASUREMENT drnm acvreading:gaincal                                    │
│  END-ADJUSTMENT                                                           │
│ REMARK Initialize test procedure variables.                              │
│  CALCULATE index& = 0                                                     │
│  CALCULATE testdatetime$ = date$[]+time$[]                                │
│  CALCULATE reports = testdatetime$+chr$[13]+chr$[10]                      │
│ REMARK Test the frequency response from 10Hz to 100kHz.                   │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                                     │
│ REMARK Set the Function Generator frequency to freq$                      │
│  NEXT                                                                     │
│ END-PROCEDURE                                                          ↓  │
└───────────────────────────────────────────────────────────────────────────┘
```
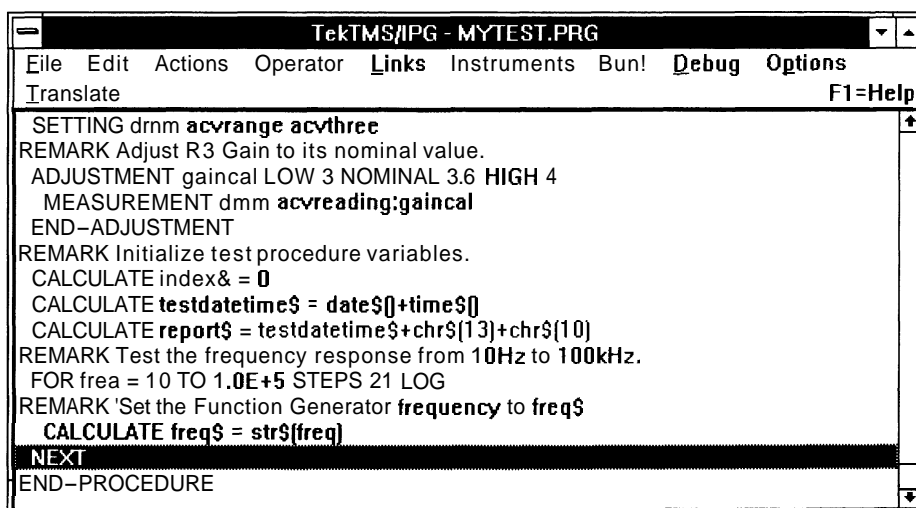
15. Defining a Test Variable within the Loop

Create this step using the same procedure that you used in *Step 11, Assigning and Initializing Test Variables,* parts *a.* and *b.* Enter `freq$` in the **Variable:** edit box, and `str$(freq)` in the **Expression:** edit box. (`str$()` is a built-in IPG function.) Verify that your display matches the following illustration.

```
                          CALCULATE
 Edit   label   Comment

 Variable:                    Expression:
 freq$                    =   str$(freq)

             ┌──────────┐       ┌──────────┐
             │    OK    │       │  Cancel  │
             └──────────┘       └──────────┘
```
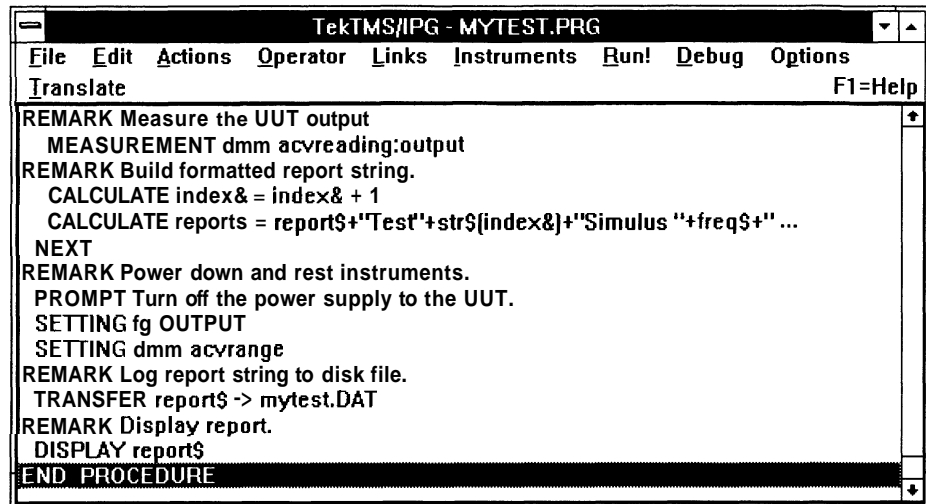
Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
 ▬                 TekTMS/IPG - MYTEST.PRG                    ▼ ▲
 File   Edit   Actions   Operator   Links   Instruments   Bun!   Debug   Options
 Translate                                                    F1=Help
   SETTING drnm acvrange acvthree                                    ♦
 REMARK Adjust R3 Gain to its nominal value.
  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4
    MEASUREMENT dmm acvreading:gaincal
  END-ADJUSTMENT
 REMARK Initialize test procedure variables.
  CALCULATE index& = 0
  CALCULATE testdatetime$ = date$()+time$()
  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)
 REMARK Test the frequency response from 10Hz to 100kHz.
  FOR frea = 10 TO 1.0E+5 STEPS 21 LOG
 REMARK 'Set the Function Generator frequency to freq$
   CALCULATE freq$ = str$(freq)
  NEXT
 END-PROCEDURE                                                       ♦
```

16. Setting an Instrument within the Loop

This step is created in the same manner as Step 6, Setting the Instruments.

Perform the following to create this SETT■NG step for the Function Generator (fg):

a. Point and double-click the mouse on the *fg* icon at the bottom of the display, or click on the icon and select **Restore** from the Control Menu that will appear. When the front panel view and menu appears, select the **FREQUENCY** edit box to assign it as the currently selected control (this action will also place a blinking cursor in the edit control box). Verify that your display matches the following illustration.
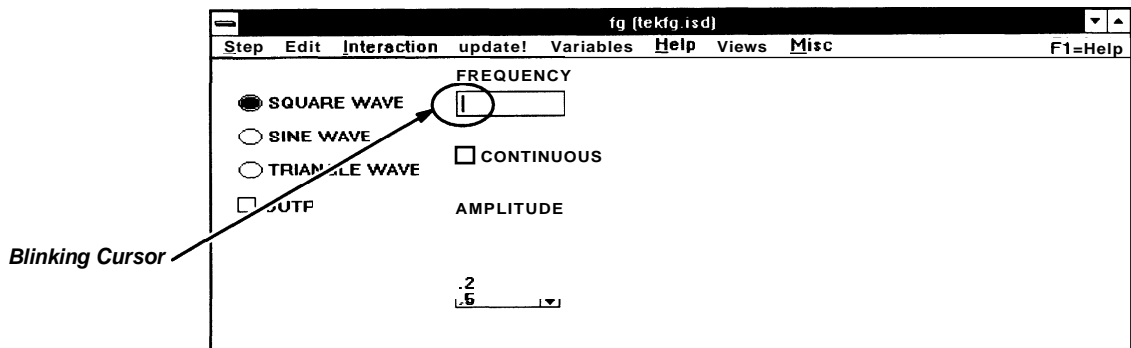
b. Select **Variables.** When the Variables Menu appears, select the **Current Control...** menu item. After the Variable dialog box appears, enter freq$ in the **Variable:** edit box.

NOTE

It is important that the control variable name matches the string representation of the FOR-NEXT variable, since this is how values from the test procedure are transferred to the front panel controls the CALCULATE Step (created in 15. Defining a Test Variable within the Loop) is necessary because the front panel control expects data that is a string representation of a number.

Verify that your display matches the following illustration.

---

c.   Select the **OK** pushbutton to assign the variable and return to the front panel view. Select **Step.** When the Step Menu appears, select the **Save Selected Settings...** menu item. After the Selected Settings dialog box appears, select **FREQUENCY** from the **Control List** list box and select the **Add** pushbutton. **FREQUENCY** will appear in the **Selected Control** list box, as shown in the following illustration.
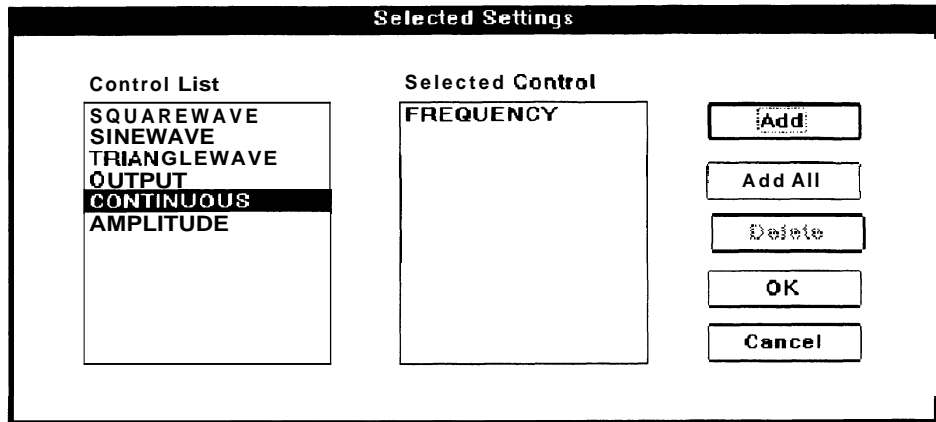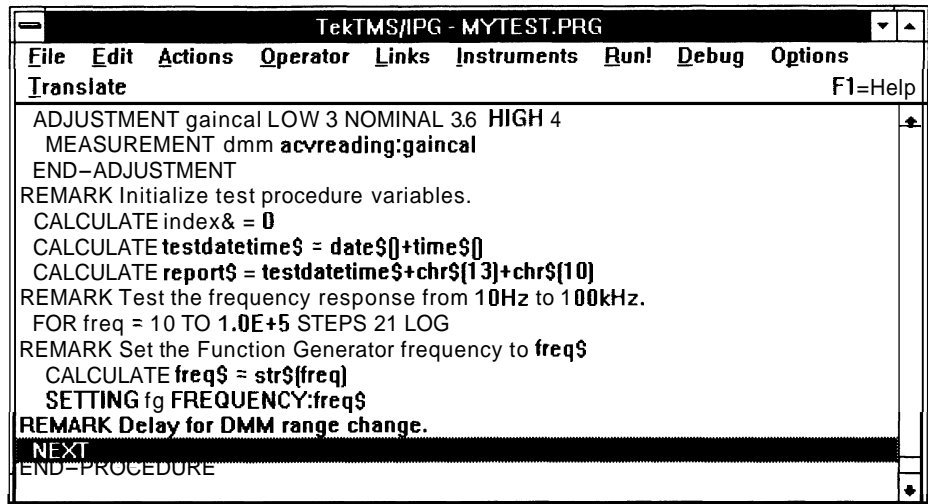
d.   Select the **OK** pushbutton to create the step and return to the front panel view. Minimize the front panel view, which will also return you to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)
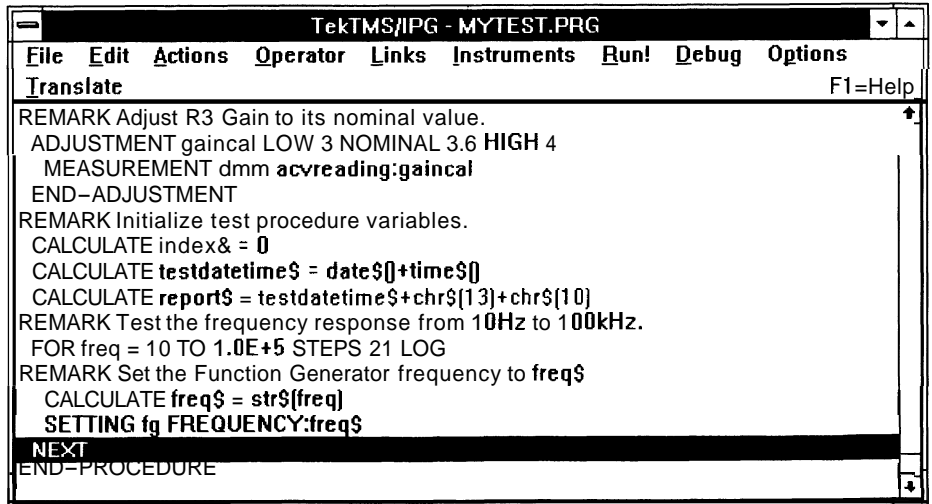
17. Entering the Seventh Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the *First* Remark. The only difference is that you will enter Delay for DMM range change. for the REMARK text. When you have completed entering the REMARK, selected the **OK** pushbutton, and returned to the Main Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌──────────────────────────────────────────────────────────────────┐
│ ▬                    TekTMS/IPG - MYTEST.PRG              ▼ ▲       │
├──────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                  F1=Help │
├──────────────────────────────────────────────────────────────────┤
│  ADJUSTMENT gaincal LOW 3 NOMINAL 3.6  HIGH 4                    ◆  │
│    MEASUREMENT dmm acvreading:gaincal                               │
│  END-ADJUSTMENT                                                     │
│ REMARK Initialize test procedure variables.                         │
│   CALCULATE index& = 0                                              │
│   CALCULATE testdatetime$ = date$()+time$()                         │
│   CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)               │
│ REMARK Test the frequency response from 10Hz to 100kHz.             │
│   FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                              │
│ REMARK Set the Function Generator frequency to freq$                │
│     CALCULATE freq$ = str$(freq)                                    │
│     SETTING fg FREQUENCY:freq$                                      │
│ REMARK Delay for DMM range change.                                  │
│     NEXT                                                            │
│ END-PROCEDURE                                                       │
│                                                                  ◆  │
└──────────────────────────────────────────────────────────────────┘
```

18. Creating a Program Delay within the Loop

A DELAY step momentarily delays the program for some minimum time during runtime.

Perform the following to create a DELAY step:

a. Select Actions from the Main Menu bar. When the Actions Menu appears, select the **Delay...** menu item. After the Delay dialog box appears, enter 300 in the edit control box (this number represents the number of milliseconds of delay) and verify that your display matches the following illustration.
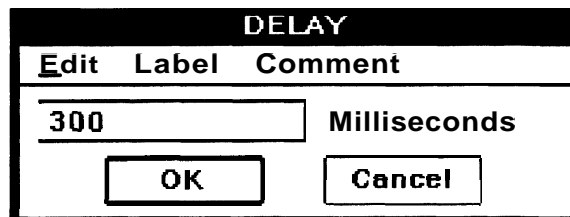
```
┌──────────────────────────────────────┐
│               DELAY                    │
├──────────────────────────────────────┤
│  Edit    Label    Comment              │
├──────────────────────────────────────┤
│  ┌──────────────────┐                  │
│  │ 300              │    Milliseconds  │
│  └──────────────────┘                  │
│       ┌─────────┐    ┌─────────┐       │
│       │   OK    │    │ Cancel  │       │
│       └─────────┘    └─────────┘       │
└──────────────────────────────────────┘
```

b.   Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬              TekTMS/IPG - MYTEST.PRG                        ▼ ▲     │
├─────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Bun!  Debug  Options │
│ Translate                                                    F1=Help  │
├─────────────────────────────────────────────────────────────────────┤
│   MEASUREMENT dmm acvreading:gaincal                                ▲ │
│  END–ADJUSTMENT                                                       │
│ REMARK Initialize test procedure variables.                          │
│  CALCULATE index& = 0                                                 │
│  CALCULATE testdatetime$ = date$()+time$()                           │
│  CALCULATE reports = testdatetime$+chr$(13)+chr$(10)                 │
│ REMARK Test the frequency response from 10Hz to 100kHz.              │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                                │
│ REMARK Set the Function Generator frequency to freqS                 │
│    CALCULATE freqS = str$(freq)                                       │
│    SETTING fg FREQUENCY:freqS                                         │
│ REMARK Delay for DMM range change.                                    │
│    DELAY 300 MILLISECONDS                                             │
│    NEXT                                                                │
│ END–PROCEDURE                                                        ▼ │
└─────────────────────────────────────────────────────────────────────┘
```

19. Entering the Eighth Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter `Measure the UUT output.` for the REMARK text. When you have completed entering the REMARK, selected the OK pushbutton, and returned to the Main Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌─────────────────────────────────────────────────────────────────────┐
│ ▬              TekTMS/IPG - MYTEST.PRG                        ▼ ▲     │
├─────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Bun!  Debug  Options │
│ Translate                                                    F1=Help  │
├─────────────────────────────────────────────────────────────────────┤
│  END–ADJUSTMENT                                                     ▲ │
│ REMARK Initialize test procedure variables.                          │
│  CALCULATE index& = 0                                                 │
│  CALCULATE testdatetime$ = date$()+time$()                           │
│  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)                 │
│ REMARK Test the frequency response from 10Hz to 100kHz.              │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                                │
│ REMARK Set the Function Generator frequency to freqS                 │
│    CALCULATE freqS = str$(freq)                                       │
│    SETTING fg FREQUENCY:freq$                                         │
│ REMARK Delay for DMM range change.                                    │
│    DELAY 300 MILLISECONDS                                             │
│ REMARK Measure the UUT output                                         │
│    NEXT                                                                │
│ END_PROCEDURE                                                       ▼ │
└─────────────────────────────────────────────────────────────────────┘
```

20. Measurement Within the Loop

This step is created in an identical manner to Step 9, Taking Measurements.

Perform the following to create this MEASUREMENT step:

a. Open the *dmm* Instrument Front Panel view by double-clicking the mouse on the *dmm* icon at the bottom of the screen, or by clicking on the icon and selecting **Restore** from the menu that will appear. When the front panel view and menu appears, click the mouse on the **Measurement** edit box to assign **Measurement** as the currently selected control and to place a blinking cursor in the edit box. Verify that your display matches the following illustration.
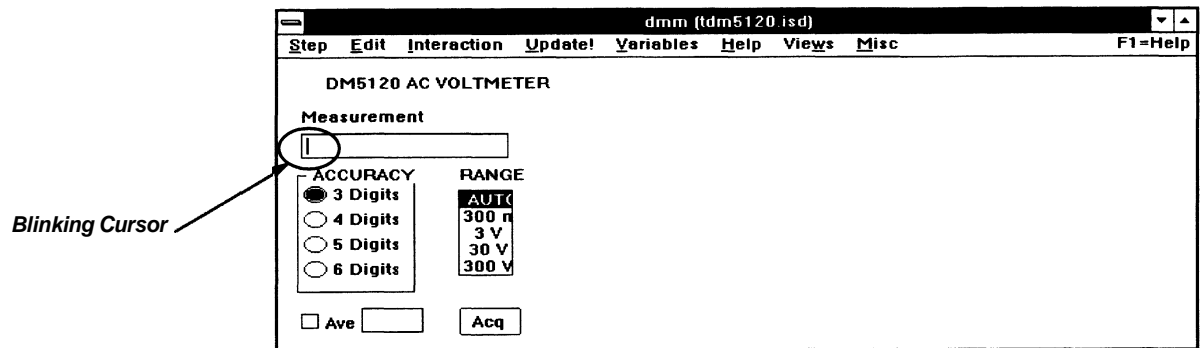
b. Select **Variables.** When the Variables Menu appears, select the **Current Control...** menu item. After the Variable dialog box appears, change the name `gaincal` in the **Variable:** edit box to `output` by clicking the mouse on the edit box, deleting the existing text by pressing the BACKSPACE or DEL keyboard key, and entering the new variable name. Verify that your display matches the following illustration.
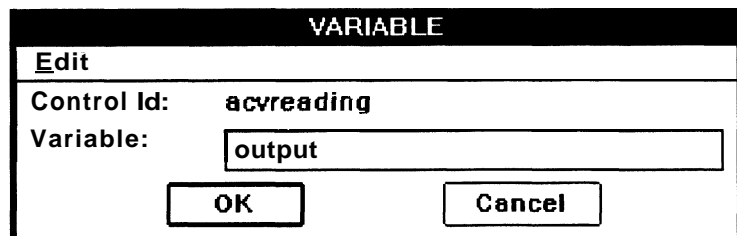
c. Select the OK pushbutton to assign the variable and return to the front panel view. Select Step. When the Step Menu appears, select the Save Selected Measurements... menu item. After the Selected Measurements dialog box appears, select acvreading from the Control List list box, then the Add pushbutton. Verify that your display matches the following illustration.

d. Select the OK pushbutton to create the step and return to the front panel view. Minimize the front panel view, which will also return you to the test procedure outline display and the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)
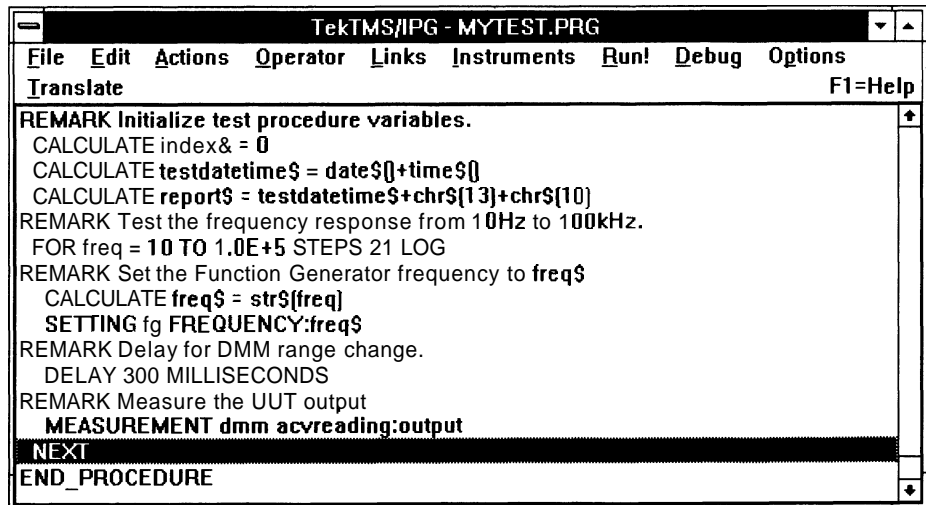
21. Entering the Ninth Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter `Build formatted report string.` for the REMARK text. When you have completed entering the REMARK, selected the **OK** pushbutton, and returned to the Main Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬               TekTMS/IPG - MYTEST.PRG                    ▼│▲   │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                  F1=Help │
├─────────────────────────────────────────────────────────────────┤
│  CALCULATE index& = 0                                          ▲  │
│  CALCULATE testdatetime$ = date$()+time$()                        │
│  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)              │
│ REMARK Test the frequency response from 10Hz to 100kHz.           │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                             │
│ REMARK Set the Function Generator frequency to freq$              │
│    CALCULATE freq$ = str$(freq)                                   │
│    SETTING fg FREQUENCY:freq$                                     │
│ REMARK Delay for DMM range change.                                │
│    DELAY 300 MILLISECONDS                                         │
│ REMARK Measure the UUT output                                     │
│    MEASUREMENT dmm acvreading:output                              │
│ REMARK Build formatted report string.                             │
│ NEXT                                                              │
│ ... PROCEDURE                                                  ▼  │
└─────────────────────────────────────────────────────────────────┘
```

22. Incrementing a Variable Within the Loop

This step is created in the same manner as Step *11*, Assigning and Initializing Test Variables.

Perform the following to create this step.

a. Select Actions from the Main Menu bar. When the Actions Menu appears, select the Calculate**...** menu item. After the Calculate dialog box appears, enter `index&` in the Variable: edit box, then click on the Expression: edit box and enter `index&+1`. Verify that your display matches the following illustration.

```
                        CALCULATE
Edit   Label   Comment

Variable:                      Expression;
 index&                =   index&+1

              OK                   Cancel
```

b. Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
 ━                  TekTMS/IPG - MYTEST.PRG               ▼ ▲
 File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options
 Translate                                                      F1=Help
  CALCULATE testdatetime$ = date$()+time$()                          ▲
  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)
 REMARK Test the frequency response from 10Hz to 100kHz.
  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG
 REMARK Set the Function Generator frequency to freq$
   CALCULATE freq$ = str$(freq)
   SETTING fg FREQUENCY:freq$
 REMARK Delay for DMM range change.
   DELAY 300 MILLISECONDS
 REMARK Measure the UUT output
   MEASUREMENT dmm acvreading:output
 REMARK Build formatted report string.
   CALCULATE index& = index& + 1
  NEXT
 END=PROCEDURE                                                       ▼
```

23. Defining a Report Format within the Loop

This step is created in the same manner as Step *11, Assigning and Initializing Test Variables.*

Perform the following to create this step.

a. Select **Actions** from the Main Menu bar. When the Actions Menu appears, select the **Calculate...** menu item. After the Calculate dialog box appears, enter `report$` in the **Variable:** edit box, then click on the **Expression:** edit box and enter `report$ + "Test "` `+ str$(index&) + " Stimulus " + freq$ + " Hz " +` `str$(output) + " ACV RMS " + chr$(13) + chr$(10).` Verify that your display matches the following illustration. (Notice that IPG has scrolled the entry for the **Expression:.)**
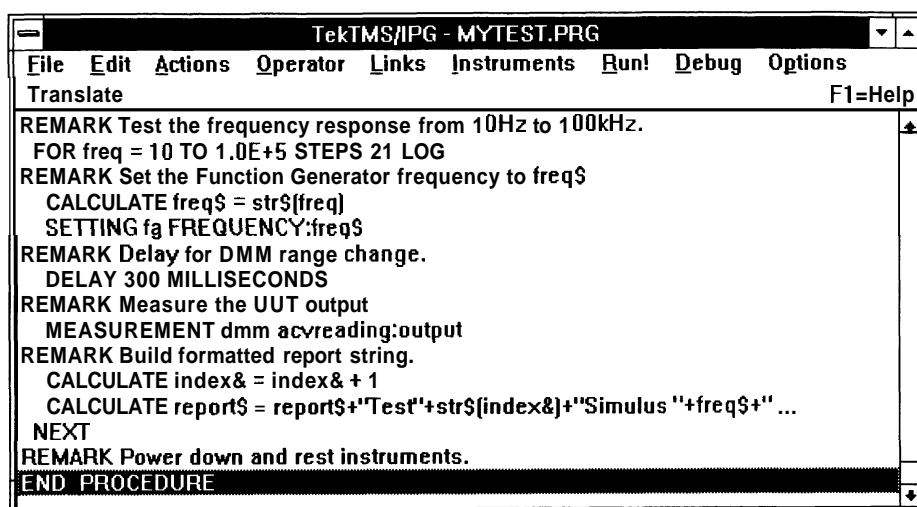
```
┌──────────────────────────────────────────────────────────────┐
│                          CALCULATE                            │
├──────────────────────────────────────────────────────────────┤
│ Edit   Label   Comment                                        │
├──────────────────────────────────────────────────────────────┤
│ Variable:                    Expression:                      │
│ │report$            │   = │ut) + " ACV RMS " + chr$(13) + chr$(10)│ │
│              ┌─────────┐          ┌──────────┐                │
│              │   OK    │          │  Cancel  │                │
│              └─────────┘          └──────────┘                │
└──────────────────────────────────────────────────────────────┘
```

b. Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration. (Notice that IPG has truncated the entry for the **Expression:.** The ellipsis shows that there was more data than would fit on the screen in the Outline view.)

```
┌────────────────────────────────────────────────────────────────────┐
│ ▬          TekTMS/IPG - MYTEST.PRG                      ▼ ▲          │
├────────────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                              F1=Help      │
├────────────────────────────────────────────────────────────────────┤
│  CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)            ▲    │
│ REMARK Test the frequency response from 10Hz to 100kHz.             │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                               │
│ REMARK Set the Function Generator frequency to freq$                │
│   CALCULATE freq$ = str$(freq)                                      │
│   SETTING fg FREQUENCY:freq$                                        │
│ REMARK Delay for DMM range change.                                  │
│   DELAY 300 MILLISECONDS                                            │
│ REMARK Measure the UUT output                                       │
│   MEASUREMENT dmm acvreading:output                                 │
│ REMARK Build formatted report string.                               │
│   CALCULATE index& = index& + 1                                    │
│   CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ...│
│ NEXT                                                                │
│ END-PROCEDURE                                                  ▼    │
└────────────────────────────────────────────────────────────────────┘
```

24. Entering the Tenth Remark

Highlight the END−PROCEDURE statement at the end of the procedure by clicking the mouse on it. (We are now finished entering steps within the FOR-NEXT loop.)

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter Power down and rest instruments. for the REMARK text. When you have completed entering the REMARK, selected the **OK** pushbutton, and returned to the Main Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌─────────────────────────────────────────────────────────────┐
│ ▬           TekTMS/IPG - MYTEST.PRG                    ▼ ▲    │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                F1=Help │
├─────────────────────────────────────────────────────────────┤
│ REMARK Test the frequency response from 10Hz to 100kHz.    ▲  │
│  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                          │
│ REMARK Set the Function Generator frequency to freq$          │
│   CALCULATE freq$ = str$(freq)                                │
│   SETTING fg FREQUENCY:freq$                                  │
│ REMARK Delay for DMM range change.                            │
│   DELAY 300 MILLISECONDS                                      │
│ REMARK Measure the UUT output                                 │
│   MEASUREMENT dmm acvreading:output                           │
│ REMARK Build formatted report string.                         │
│   CALCULATE index& = index& + 1                               │
│   CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │
│  NEXT                                                         │
│ REMARK Power down and rest instruments.                       │
│ END PROCEDURE                                             ▼   │
└─────────────────────────────────────────────────────────────┘
```

25. Prompting the Operator

This step is created in the same manner as Step *4,* Adding Operator Prompts.

Perform the following to create this step.

a. Select **Qperator** from the Main Menu bar. When the Operator Menu appears, select the **Prompt...** menu item. After the Prompt menu appears, select **Text.** When the Text Prompt dialog box appears, enter Turn off the power supply to the UUT in the **Message:** edit box. Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▭            TekTMS/IPG - MYTEST.PRG                          ▼  ▲     │
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate                                                    F1=Help  │
│ ┌──────────────────────────────────────────────────────────────────┬─┐│
│ │  FOR freq = 10 TO 1.0E+5 STEPS 21 LOG                             │▲││
│ │REMARK Set the Function Generator frequency to freq$              │ ││
│ │   CALCULATE freq$ = str$(freq)                                   │ ││
│ │   SETTING fg FREQUENCY:freq$                                     │ ││
│ │REMARK Delay for DMM range change.                                │ ││
│ │   DELAY 300 MILLISECONDS                                         │ ││
│ │REMARK Measure the UUT output                                     │ ││
│ │   MEASUREMENT dmm acvreading:output                              │ ││
│ │REMARK Build formatted report string.                            │ ││
│ │   CALCULATE index& = index& + 1                                  │ ││
│ │   CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │ ││
│ │  NEXT                                                            │ ││
│ │REMARK Power down and rest instruments.                          │ ││
│ │  PROMPT Turn off the power supply to the UUT.                    │ ││
│ │END  PROCEDURE                                                    │ ││
│ └──────────────────────────────────────────────────────────────────┴▼┘│
└──────────────────────────────────────────────────────────────────────┘
```

26. Setting the Instruments

These SETTING steps are created in the same manner as *Step 6, Setting the Instruments.*

Perform the following to create the SETTING Step for the Function Generator (fg).

a.   Open the *fg* Instrument Front Panel view. If necessary, click the mouse on the OUTPUT check box to turn it OFF (no "X" in the box). Verify that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▭                    fg (tekfg.isd)                          ▼  ▲     │
│  Step   Edit   Interaction   Update!   Variables   Help   Views   Misc         F1=Help │
│                        FREQUENCY                                       │
│    ● SQUARE WAVE       ┌──────────┐                                    │
│    ○ SINE WAVE         └──────────┘                                    │
│                        ☐ CONTINUOUS                                    │
│    ○ TRIANGLE WAVE                                                     │
│    ☐ OUTPUT            AMPLITUDE                                        │
│                        ┌─────────┬─┐                                   │
│                        │.02      │▲│                                   │
│                        │.05      │ │                                   │
│                        │.1       │ │                                   │
│                        │.2       │ │                                   │
│                        │.5       │▼│                                   │
│                        └─────────┴─┘                                   │
└──────────────────────────────────────────────────────────────────────┘
```
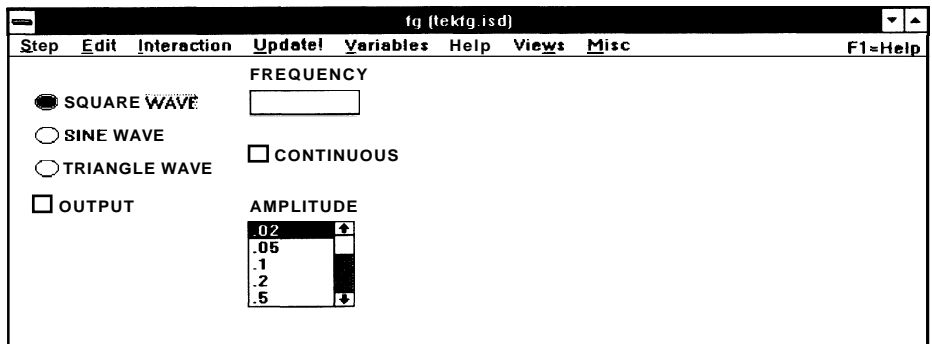
b. Select **Step**. When the Step Menu appears, select **Save Selected Settings....** After the Selected Settings dialog box appears, select OUTPUT from the **Control List** list box, then select the **Add** push-button. Verify that your display matches the following illustration.

```
┌────────────────────────────────────────────────────────────────┐
│                        Selected Settings                         │
├────────────────────────────────────────────────────────────────┤
│                                                                  │
│   Control List              Selected Control                     │
│   ┌──────────────────┐      ┌──────────────────┐    ┌─────────┐  │
│   │ SQUAREWAVE       │      │ OUTPUT           │    │  Add    │  │
│   │ SINEWAVE         │      │                  │    └─────────┘  │
│   │ TRIANGLEWAVE     │      │                  │    ┌─────────┐  │
│   │ FREQUENCY        │      │                  │    │ Add All │  │
│   │ CONTINUOUS       │      │                  │    └─────────┘  │
│   │ AMPLITUDE        │      │                  │    ┌─────────┐  │
│   │                  │      │                  │    │ Delete  │  │
│   │                  │      │                  │    └─────────┘  │
│   │                  │      │                  │    ┌─────────┐  │
│   │                  │      │                  │    │  OK     │  │
│   │                  │      │                  │    └─────────┘  │
│   │                  │      │                  │    ┌─────────┐  │
│   └──────────────────┘      └──────────────────┘    │ Cancel  │  │
│                                                     └─────────┘  │
└────────────────────────────────────────────────────────────────┘
```
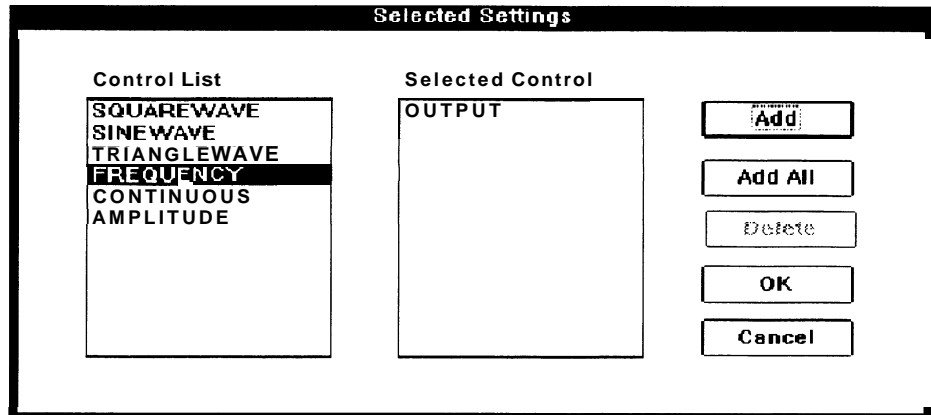
c. Select the OK pushbutton to create the step and return to the front panel view. Minimize this view to return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌────────────────────────────────────────────────────────────────┐
│ ━        TekTMS/IPG - MYTEST.PRG                        ▼   ▲    │
├────────────────────────────────────────────────────────────────┤
│  File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│  Translate                                              F1=Help  │
├────────────────────────────────────────────────────────────────┤
│ REMARK Set the Function Generator frequency to freq$        ▲   │
│    CALCULATE freq$ = str$(freq)                                 │
│    SETTING fg FREQUENCY:freq$                                   │
│ REMARK Delay for DMM range change.                              │
│    DELAY 300 MILLISECONDS                                       │
│ REMARK Measure the UUT output                                   │
│    MEASUREMENT dmm acvreading:output                            │
│ REMARK Build formatted report string.                           │
│    CALCULATE index& = index& + 1                                │
│    CALCULATE reports = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │
│  NEXT                                                           │
│ REMARK Power down and rest instruments.                         │
│   PROMPT Turn off the power supply to the UUT.                  │
│   SETTING fg OUTPUT                                             │
│ END_PROCEDURE                                                   │
│                                                             ▼   │
└────────────────────────────────────────────────────────────────┘
```

Perform the following to create the SETT ■NG step for the DMM *(dmm).*

d. Open the ***dmm*** Instrument Front Panel view. Select **AUTO** from the **RANGE** list box. Verify that your display matches the following illustration.
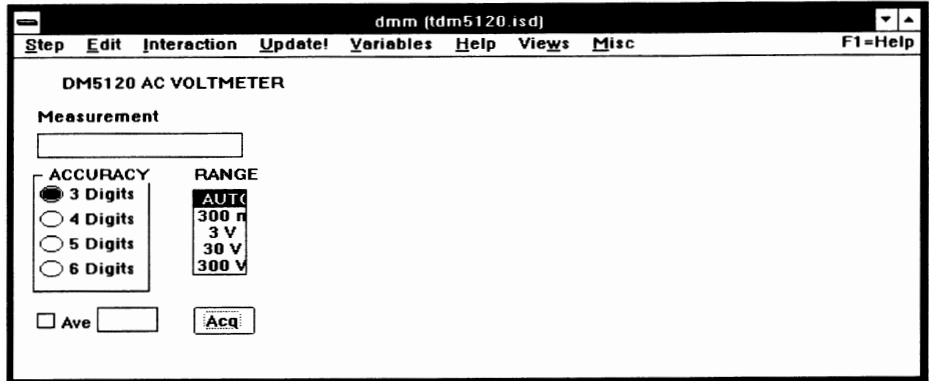
e. Select **Step.** When the Step Menu appears, select **Save Selected Settings....** After the Selected Settings dialog box appears, select **acvrange** from the **Control List** list box, then select the **Add** pushbutton. Verify that your display matches the following illustration.
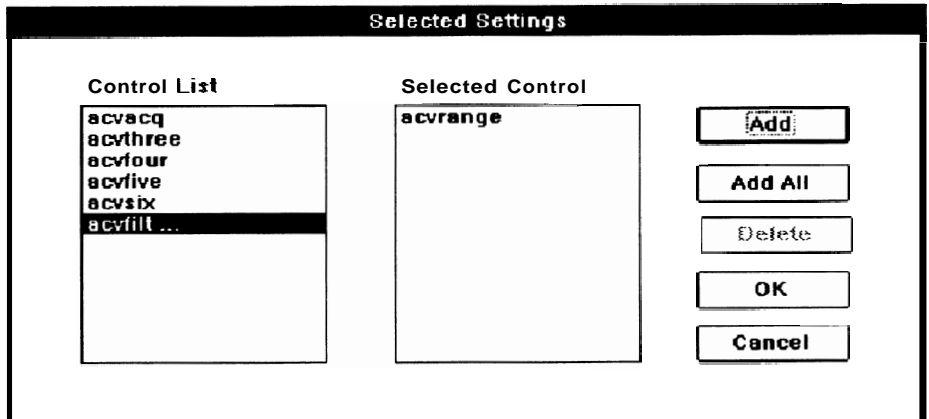
f. Select the **OK** pushbutton to create the step and return to the front panel view. Minimize the front panel view to return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▬          TekTMS/IPG - MYTEST.PRG                              ▼ ▲    │
├──────────────────────────────────────────────────────────────────────┤
│  File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│  Translate                                                     F1=Help │
│ ┌──────────────────────────────────────────────────────────────────┐ │
│ │    CALCULATE freq$ = str$(freq)                                  ↑│ │
│ │    SETTING fg FREQUENCY:freq$                                     │ │
│ │ REMARK Delay for DMM range change.                                │ │
│ │    DELAY 300 MILLISECONDS                                         │ │
│ │ REMARK Measure the UUT output                                     │ │
│ │    MEASUREMENT drnrn acvreading:output                            │ │
│ │ REMARK Build formatted report string.                             │ │
│ │    CALCULATE index& = index& + 1                                  │ │
│ │    CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │ │
│ │  NEXT                                                             │ │
│ │ REMARK Power down and rest instruments.                           │ │
│ │  PROMPT Turn off the power supply to the UUT.                     │ │
│ │  SETTING fg OUTPUT                                                │ │
│ │  SETTING dmm acvrange                                             │ │
│ │ END PROCEDURE                                                    ▓│ │
│ └──────────────────────────────────────────────────────────────────┘ │
└──────────────────────────────────────────────────────────────────────┘
```

27. Entering the Eleventh Remark

The procedure for entering this REMARK is identical to that used in *Step 2, Entering the First* Remark. The only difference is that you will enter `Log report string to disk file.` for the REMARK text. When you have completed entering the REMARK, selected the OK pushbutton, and returned to the Main Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌──────────────────────────────────────────────────────────────────────┐
│ ▬          TekTMS/IPG - MYTEST.PRG                              ▼ ▲    │
├──────────────────────────────────────────────────────────────────────┤
│  File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│  Translate                                                     F1=Help │
│ ┌──────────────────────────────────────────────────────────────────┐ │
│ │    SETTING fg FREQUENCY:freq$                                    ↑│ │
│ │ REMARK Delay for DMM range change.                                │ │
│ │    DELAY 300 MILLISECONDS                                         │ │
│ │ REMARK Measure the UUT output                                     │ │
│ │    MEASUREMENT dmrn acvreading:output                             │ │
│ │ REMARK Build formatted report string.                             │ │
│ │    CALCULATE index& = index& + 1                                  │ │
│ │    CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │ │
│ │  NEXT                                                             │ │
│ │ REMARK Power down and rest instruments.                           │ │
│ │  PROMPT Turn off the power supply to the UUT.                     │ │
│ │  SETTING fg OUTPUT                                                │ │
│ │  SETTING drnm acvrange                                            │ │
│ │ REMARK Log report string to disk file.                            │ │
│ │ END PROCEDURE                                                    ▓│ │
│ └──────────────────────────────────────────────────────────────────┘ │
└──────────────────────────────────────────────────────────────────────┘
```

28. Transferring Collected Data to a File

This `TRANSFER` step transfers the data collected by the test procedure to a file named DEMOTEST.DAT.

Perform the following to create the `TRANSFER` step.

a. Select Actions from the Main Menu bar. When the Actions Menu appears, select the Transfer Data menu item. After the Transfer Data Menu appears, select **Variable** to File**....** When the Transfer Variable To File dialog box appears, enter `MYTEST` in the File Name: edit box (an extension is not required as IPG automatically adds a .DAT extension) and enter `report$` in the Variable: edit box. Verify that your display matches the following illustration.

```
┌──────────────────────────────────────────────────────┐
│              TRANSFER VARIABLE TO FILE                 │
├──────────────────────────────────────────────────────┤
│   Edit    Label    Comment                             │
│                                                        │
│   File Name:           Variable:                       │
│   ┌──────────────────┐ ┌──────────────────────────┐    │
│   │ mytest           │ │ report$                  │    │
│   └──────────────────┘ └──────────────────────────┘    │
│   c:\ipg                                               │
│   ┌─────────────┐ ┌▲┐   ┌───────────┐   ┌───────────┐  │
│   │ [..]        │ │ │   │    OK     │   │  Cancel   │  │
│   │ [library]   │ │ │   └───────────┘   └───────────┘  │
│   │ [-a-]       │ │░│                                  │
│   │ [-c-]       │ │░│                                  │
│   │ [-d-]       │ │ │                                  │
│   │ [-e-]       │ └▼┘                                  │
│   └─────────────┘                                      │
└──────────────────────────────────────────────────────┘
```

b. Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌──────────────────────────────────────────────────────────────┐
│ ▬            TekTMS/IPG - MYTEST.PRG                    ▼ ▲    │
├──────────────────────────────────────────────────────────────┤
│ File   Edit   Actions   Operator   Links   Instruments   Bun!   Debug   Options │
│ Translate                                              F1=Help │
├──────────────────────────────────────────────────────────────┤
│ REMARK Delay for DMM range change.                        ▲    │
│    DELAY 300 MILLISECONDS                                       │
│ REMARK Measure the UUT output                                  │
│    MEASUREMENT dmm acvreading:output                           │
│ REMARK Build formatted report string.                          │
│    CALCULATE index& = index& + 1                               │
│    CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+"... │
│  NEXT                                                          │
│ REMARK Power down and rest instruments.                        │
│  PROMPT Turn off the power supply to the UUT                   │
│   SETTING fg OUTPUT                                            │
│   SETTING drnm acvrange                                        │
│ REMARK Log report string to disk file.                         │
│   TRANSFER report$ -> mytest.DAT                              │
│ END PROCEDURE                                             ▼    │
└──────────────────────────────────────────────────────────────┘
```

29. Entering the Final Remark

The procedure for entering this REMARK is identical to that used in Step 2, Entering the First Remark. The only difference is that you will enter Display report. for the REMARK text. When you have completed entering the REMARK, selected the **OK** pushbutton, and returned to the Main Menu, your display should match the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬              TekTMS/IPG - MYTEST.PRG                    ▼ ▲     │
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                                 F1=Help │
│ REMARK Measure the UUT output                                  ↑  │
│   MEASUREMENT dmm acvreading:output                               │
│ REMARK Build formatted report string.                             │
│   CALCULATE index& = index& + 1                                   │
│   CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │
│  NEXT                                                             │
│ REMARK Power down and rest instruments.                           │
│  PROMPT Turn off the power supply to the UUT.                     │
│  SETTING fg OUTPUT                                                │
│  SETTING dmm acvrange                                             │
│ REMARK Log report string to disk file.                            │
│   TRANSFER report$ -> mytest.DAT                                  │
│ REMARK Display report.                                            │
│  DISPLAY report$                                                  │
│ END  PROCEDURE                                                 ↓  │
└─────────────────────────────────────────────────────────────────┘
```

30. Displaying the Data

This procedure creates a DISPLAY step to display the data collected during the test, and adds a user-defined title to the display.

Perform the following to create a DISPLAY step:

a. Select **Operator** from the Main Menu bar. When the Operator Menu appears, select the **Display Data** menu item. After the Display Data Menu appears, select **Wait....** When the Display Data Wait dialog box appears, click on the **Caption:** edit box and enter Frequency vs Gain Data for MYTEST.PRG, then click on the **Expression:** edit box and enter report$. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────┐
│                    DISPLAY DATA WAIT                          │
├─────────────────────────────────────────────────────────────┤
│ Edit   Label   Comment                                       │
│ Caption:                                                      │
│ ┌──────────────────────────────────────────────────────┐ ▲ │
│ │ Frequency vs Gain Data for MYTEST.PRG.               │ ▓ │
│ │                                                       │ ▓ │
│ │                                                       │ ▓ │
│ │                                                       │ ▓ │
│ │                                                       │ ▓ │
│ └──────────────────────────────────────────────────────┘ ▼ │
│ Expression:                                                  │
│ │report$                                              │      │
│       ┌──────────────┐         ┌──────────────┐             │
│       │      OK       │         │   Cancel     │             │
│       └──────────────┘         └──────────────┘             │
└─────────────────────────────────────────────────────────────┘
```

b. Select the **OK** pushbutton to create the step and return to the Main Menu. Verify that your display matches the following illustration. (You may need to scroll the display for all the steps shown in the illustration to be visible.)

```
┌─────────────────────────────────────────────────────────────┐
│ ▬            TekTMS/IPG - MYTEST.PRG               ▼ ▲       │
├─────────────────────────────────────────────────────────────┤
│ File  Edit  Actions  Operator  Links  Instruments  Run!  Debug  Options │
│ Translate                                              F1=Help          │
├─────────────────────────────────────────────────────────────┤
│    DELAY 300 MILLISECONDS                                   ▲│
│ REMARK Measure the UUT output                               │ │
│    MEASUREMENT dmm acvreading:output                        │ │
│ REMARK Build formatted report string.                       │ │
│    CALCULATE index& = index& + 1                            │ │
│    CALCULATE report$ = report$+"Test"+str$(index&)+"Simulus "+freq$+" ... │
│  NEXT                                                        │ │
│ REMARK Power down and rest instruments.                     │ │
│  PROMPT Turn off the power supply to the UUT.               │ │
│  SETTING fg OUTPUT                                          │ │
│  SETTING dmm acvrange                                       │ │
│ REMARK Log report string to disk file.                     │ │
│  TRANSFER report$ -> mytest.DAT                             │ │
│ REMARK Display report.                                      │ │
│ END PROCEDURE                                               ▼│
└─────────────────────────────────────────────────────────────┘
```

c. Select **File** from the Main Menu bar. When the File Menu appears, select the **Save** menu item. This completes the test procedure.

If you have the instrumentation and want to run the procedure, refer to the Run Menu description in Section **4,** Menus for further information.

Waveform Displays

A waveform display window and an associated menu will appear when an instrument front panel view (.ISD file) has a control type called Waveform Display and you select its icon, or when you run a test procedure containing a DISPLAY DATA step of a waveform variable. In this manual, the associated menu is referred to as the Waveform Menu. An illustration of the waveform display and Waveform Menu is shown later under the topic Using the Waveform Menu. For additional information about the Waveform Menu, refer to Section 5, Menus.

The remainder of this discussion of waveform displays is in the form of a waveform display tutorial. We will use the Waveform Menu while running a user created test procedure having a DISPLAY DATA step of a waveform variable.

Overview

In the following waveform display tutorial, you will first create a two-step waveform display test procedure and name it TEKWAVE.PRG. (If you created the tutorial program TEST2.PRG in Section 3, you can use it. If you have that program, load it now and proceed to Using the Waveform Menu).

The first step of this procedure transfers a waveform data file named TEK-WAVE.WFD to a waveform variable named wfml ~ . The second step displays the waveform variable. The waveform data file, TEKWAVE.WFD, is provided on the IPG program disk, and should already be stored on the your machine with the other program files.

Once you have created the procedure, you will run it and exercise the Waveform Menu selections to demonstrate the action they have on the display. The Waveform Menu selections are described under the Using the Waveform Menu topic following.

Creating a Waveform Display Procedure

Perform the following steps to create a waveform display procedure:

1. Select **File** from the Main Menu bar. When the File menu appears, select the **New** menu item. When the Main Menu returns, select **Actions.** When the Actions Menu appears, select the **Transfer Data** menu item. After the Transfer Data menu appears, select **File to Variable...**, then select the **OK** pushbutton. When the Transfer File To Variable dialog box appears, enter `tekwave.wfd.` in the **File Name:** edit box and `wfml-` in the **Variable:** edit box. Select the **OK** pushbutton.

2. Select **Operator** from the Main Menu bar. When the Operator Menu appears, select the **Display Data** menu item. After the Display Data Menu appears, select **Wait....** When the Display Data Wait dialog box appears, enter `wfml~` in the **Expression:** edit box. Put one line of text of less than 32 characters in the caption if you wish text in the title bar of the waveform display. Select the **OK** pushbutton.

3. Select **File** from the Main Menu bar. When the File menu appears, select the **Save as...** menu item. After the Save As dialog box appears, enter `tekwave` in the **Save file as:** edit box (you do not have to enter a file extension, since IPG will automatically add a .PRG). Select the **Save** pushbutton. Verify that your display matches the following illustration.

```
┌─────────────────────────────────────────────────────────────────┐
│ ▬                      TekTMS/IPG - TEKWAVE.PRG            ▼ ▲ │
│ File   Edit   Actions   Operator   Links   Instruments   Run!   Debug   Options │
│ Translate                                                    F1=Help │
│ PROCEDURE TEKWAVE ( )                                             │
│   TRANSFER tekwave.wfd -> wfm~                                    │
│   DISPLAY wfm~                                                    │
│ END_PROCEDURE                                                    │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```
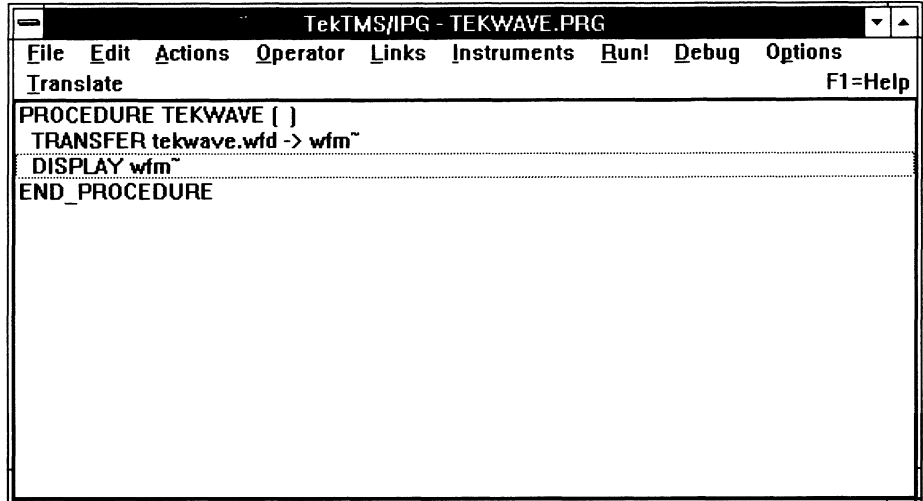
Using the Waveform Menu

Perform the following to display the waveform and the Waveform Menu:

1. Select **Run** from the Main Menu bar. When the Run Menu appears, select the **All** menu item. The following waveform display and its Waveform Menu will appear.

NOTE

If you are using a monochrome display, the waveform will not be visible when it first appears. To correct this, select **Qptions** from the Waveform Menu. When the Options Menu appears, select **Colors and Styles....** After the Colors and Styles dialog box *ap*-pears (refer to Step *H,* further in this procedure for further information), click on **Set Graph Background** in the **Selections** list box, then click on the white square in the **Colors** list box. Select **OK** to return to the waveform display The waveform should now be visible.
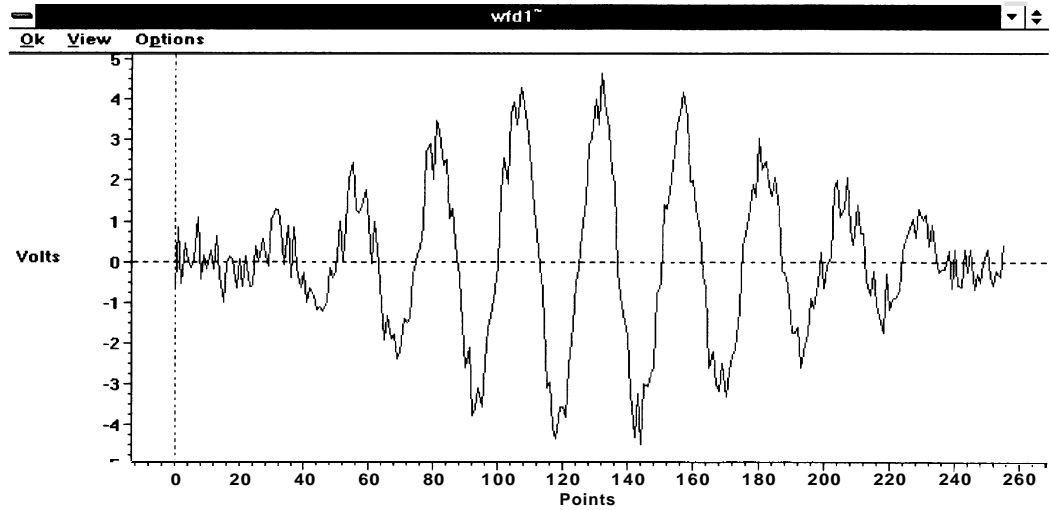
2. Select **View** from the Waveform Menu. When the View Menu appears, select the **Zoom** menu item. The cursor will change to a left corner graphic symbol (⌐) as shown in the following display.
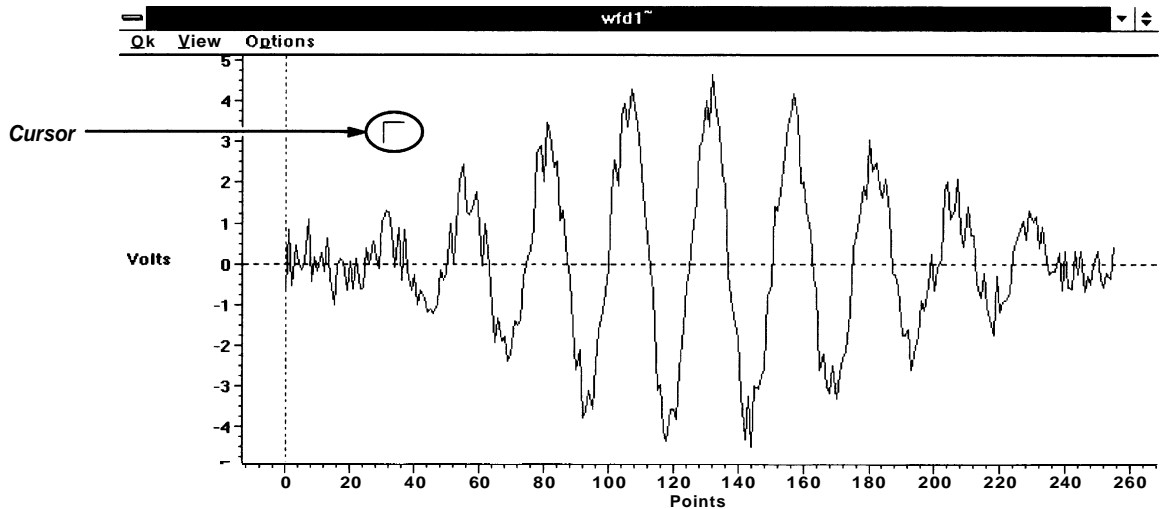
Cursor

3. We will now create an enclosing rectangle around the top peaks of the three highest waveforms (the highest peak and the ones on each side of it). To do that, move the cursor (do not click) to a position where you want the upper left corner of the rectangle to be. Then click and hold the left mouse button and drag the cursor down and to the right until the resulting enclosing rectangle includes the three highest peaks. Release the mouse button. When the display returns, it should look similar to the following illustration.

wfd1~

Ok   View   Options

Volts

4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0

95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 1

Points
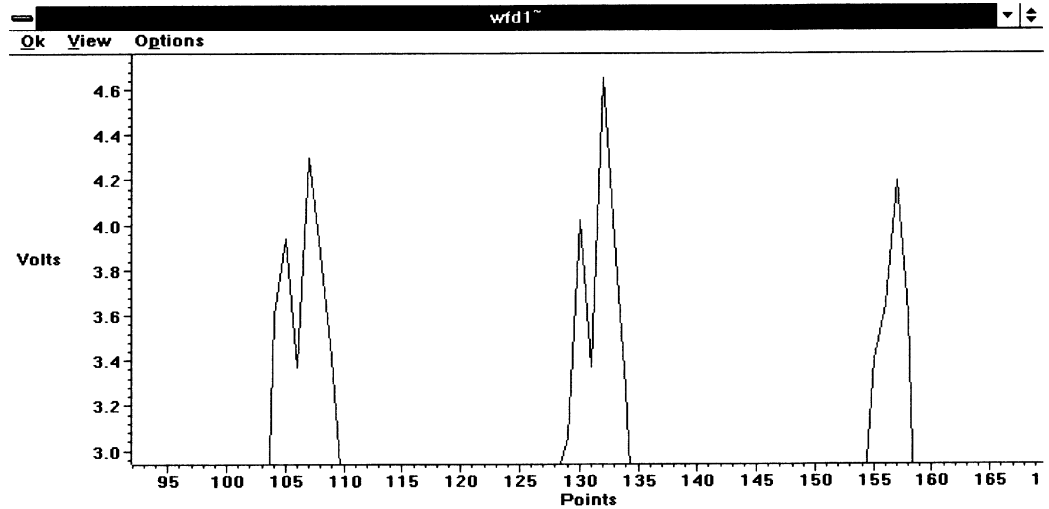
4. Select View. When the View Menu appears, select the **Full** View menu item. After the display returns, the entire waveform should be visible as it was before it was zoomed.

5. Select Qptions. When the Options Menu appears, select the Scroll Bars menu item. After the display returns, scroll bars will be present, as in the following illustration.

wfd1~

Ok   View   Options

Volts

5
4
3
2
1
0
-1
-2
-3
-4

0 20 40 60 80 100 120 140 160 180 200 220 240 260

Points
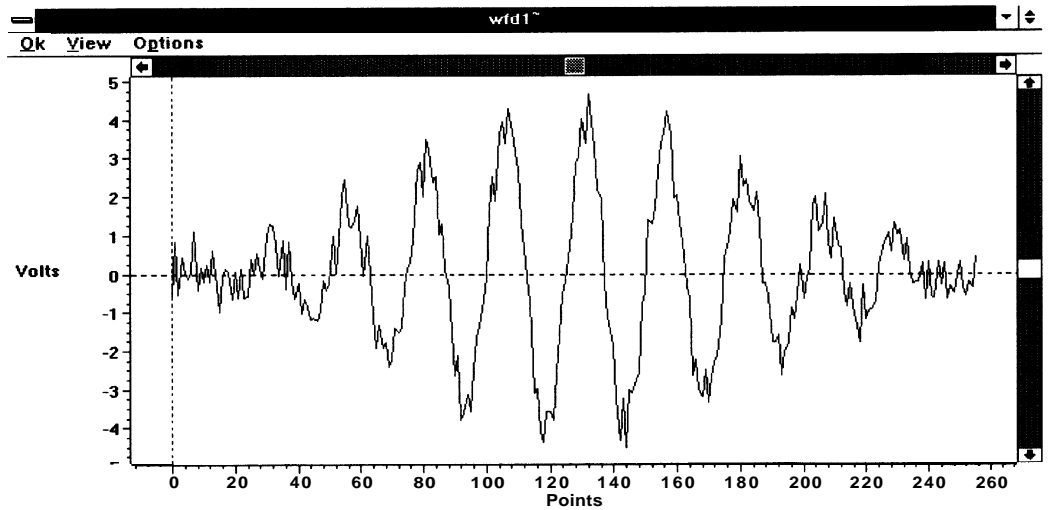
6. Select Qptions. When the Options Menu appears, note that the Scroll Bars menu item has a check mark in front of it, indicating that it is enabled. Select the Grid menu item. When the display returns, vertical and horizontal grid will be present, as in the following illustration.
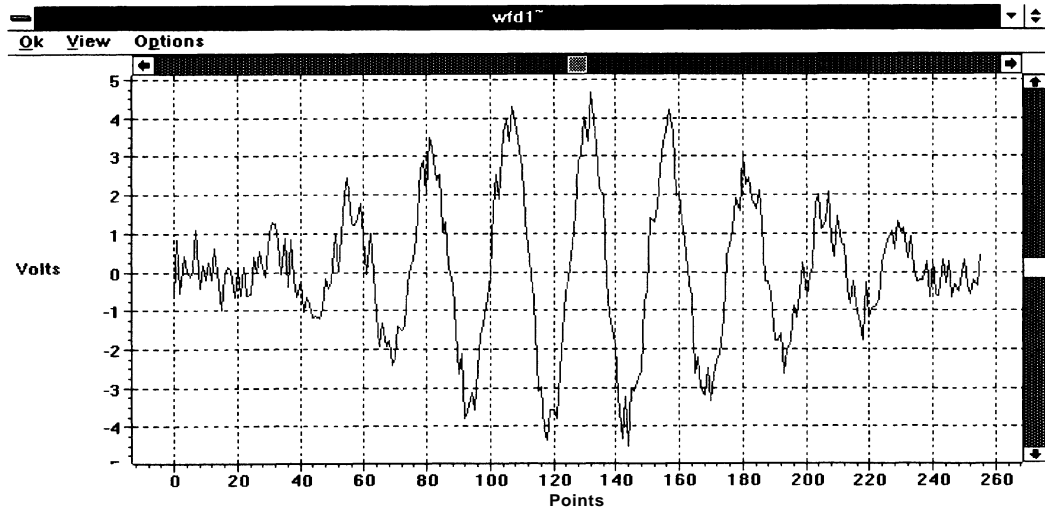
7. At this point, we will demonstrate some of the ways to move the waveform display within the window. As you perform each of the following actions, notice how the waveform display moves.

■ Place the cursor at various places on the scroll bar and click the mouse. Place the cursor on the scroll boxes, then click and drag the boxes to various points on the scroll bars. Place the mouse cursor on the scroll bar arrows and click the mouse.

■ Press the arrow directional keys on the numeric keypad, or press the arrow directional keys on the directional arrow keypad (if your keyboard is so equipped).

■ Alternately move the cursor off the display just to the left or below the waveform work area (in the scale area). A double-ended arrow cursor will appear in each of the axes. A vertical double-arrow will appear on the Y axis (shown in the illustration below), and a horizontal double-arrow will appear on the X axis. While the double-arrow is visible, alternately click the left and right mouse buttons and notice which direction the display moves.

Double Arrow
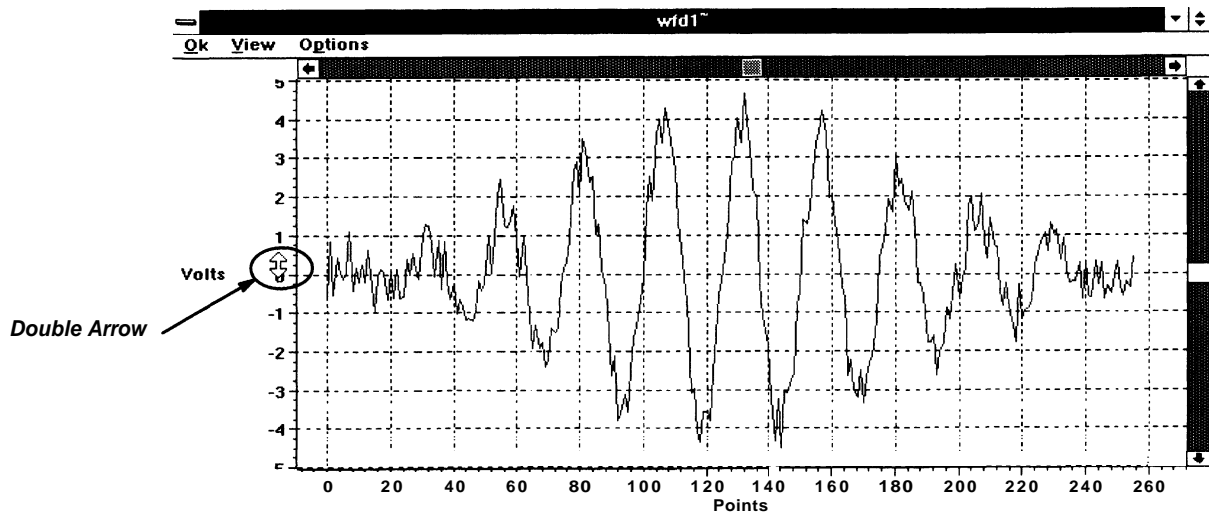
8. Select **Qptions.** When the Options Menu appears, select the **Display Cursor** menu item. After the display returns, it will have a vertical and horizontal display cursor, as shown in the following illustration.
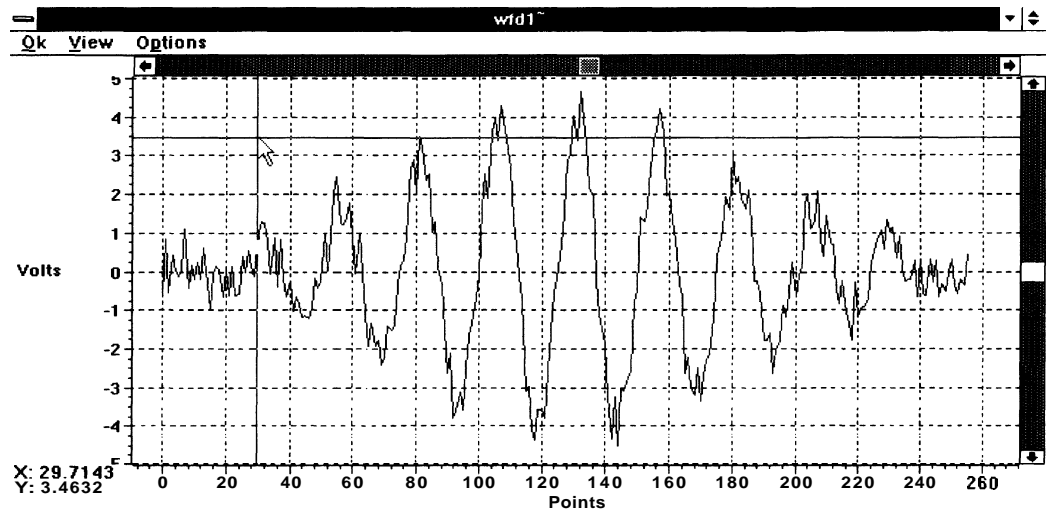
9. Move the mouse left and right and up and down (do not click). Note the following:

- The cursors move independently depending on which direction the mouse moves.

- The cursors can be moved off the waveform in each direction.

   The cursor values are given in X: and Y: in the lower left corner of the display.

10. Select **Options.** When the Options Menu appears, select **Waveform Cursor.** After the display returns, the cursor will have changed to a vertical and horizontal waveform cursor, as shown in the following illustration.
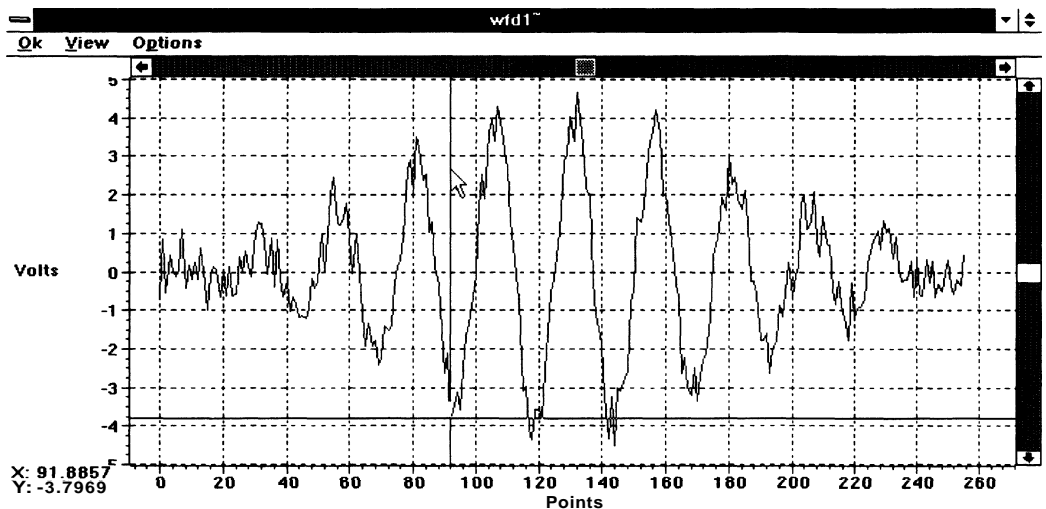
11. Observe the cursors while moving the mouse left, right, up, and down. Notice the following:

- The vertical (time) cursor follows the mouse movement, but the horizontal cursor (amplitude) does not. (The horizontal cursor may move slightly when the mouse is moved up and down, but that is because there is usually also some slight left and right movement.)

- Both cursors disappear when you attempt to move the vertical cursor off the waveform. Thus, you cannot move either cursor off the waveform.

- The horizontal cursor tracks the amplitude of the same waveform point that the vertical cursor is on. Because of this, the horizontal cursor never goes above or below the waveform point.

  The cursor values are shown in x: and Y: in the lower left corner of the display.

NOTE

Waveform cursors can only be manipulated with the mouse: there is no keyboard interface.

12. Select **Options.** When the Options Menu appears, select the **Amplitude Cursors** menu item. After the display returns, the cursors will have changed to two horizontal amplitude cursors, as shown in the following illustration. (The cursors are identified with a small boxed 1 and 2 in the vertical scale area.)
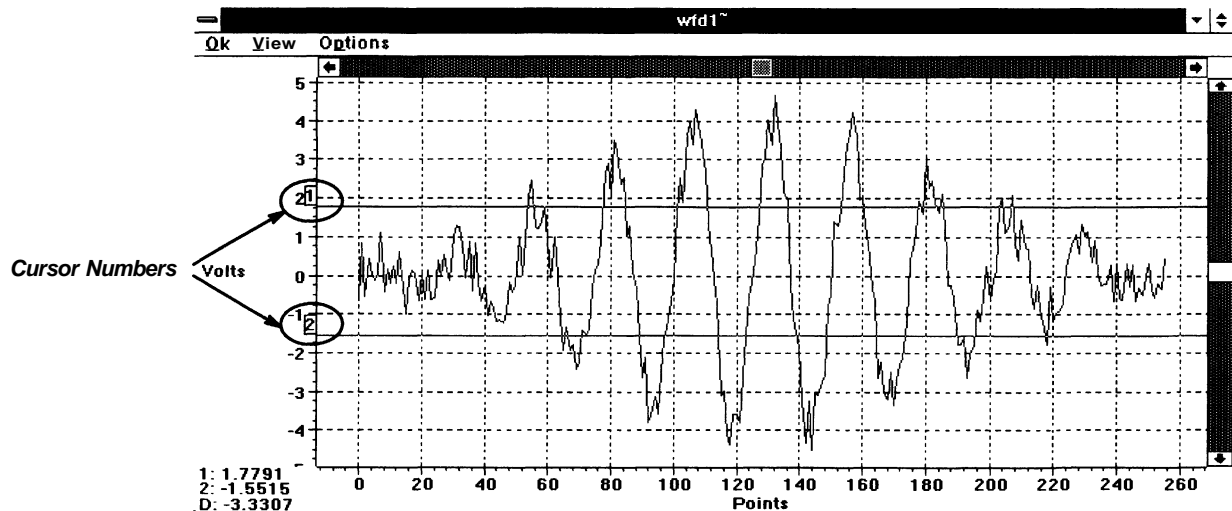
13. Alternately drag the cursors up or down by clicking the mouse on that cursor (notice that the cursor arrow changes to a hand) and holding the mouse button while you move the mouse. As the cursors move, note the cursor values in 1: and 2:, and the delta difference value in D:, in the lower left corner of the display.

14. Select **Options.** When the Options Menu appears, select the **lime Cursors** menu item. After the display returns, the cursors will have changed to two Time Cursors as shown in the following illustration. (The cursors are identified with a small boxed 1 and 2 in the top scroll bar area.)
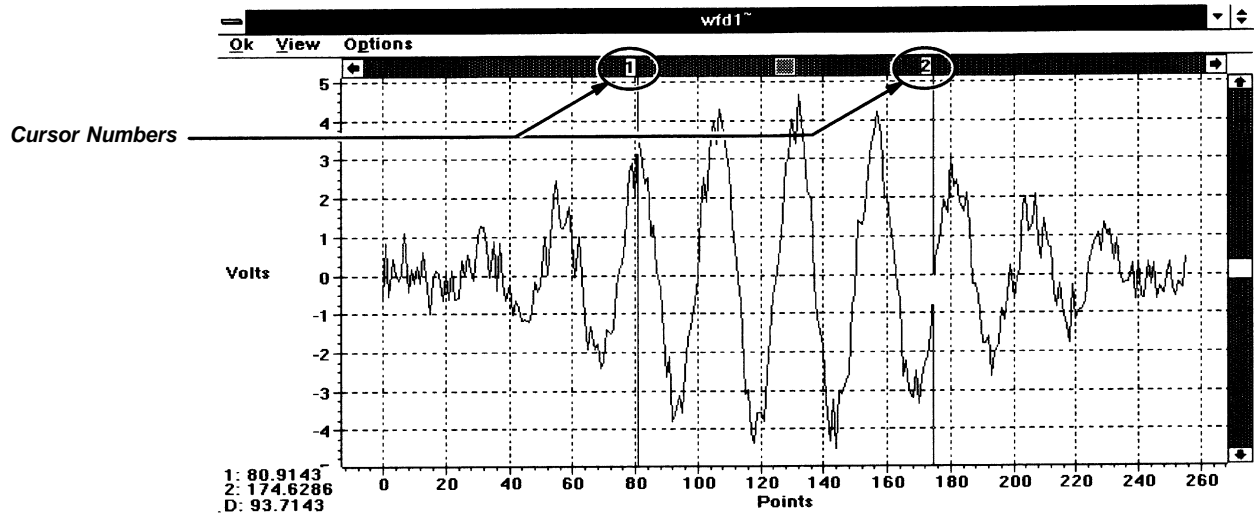
15. Alternately click and drag the cursors left and right. As the cursors move, notice the cursor values in 1: and 2:, and the delta difference value in D:, in the lower left corner of the display.

NOTE

If you are viewing this waveform on a monochrome display, the following procedure will produce results (in some of the options) that will not allow a visible waveform.

16. Select **Qptions.** When the Options Menu appears, select the **Colors and Styles...** menu item. The following Colors and Styles dialog box will appear.

Colors and Styles

☐ Points Only

Selections

wave~
Set Grid
Set Axes
Set Background
Set Graph Background
Set Labels

Line Styles

Sample

Colors

V

Sec

OK   CANCEL
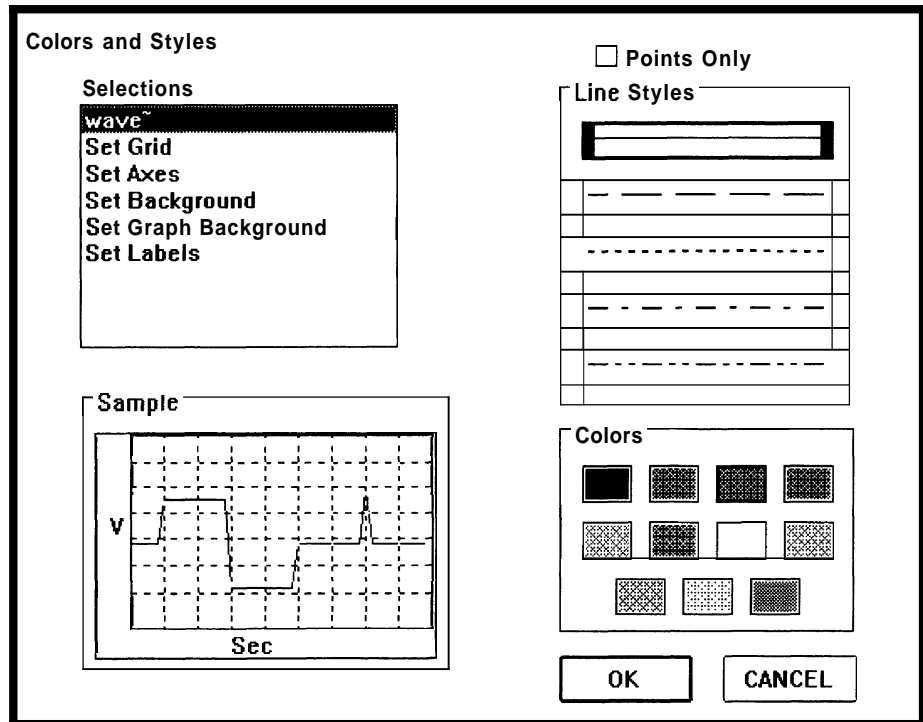
17. Alternately select items from the **Selections** list box. Then select different line styles and colors from the **Line Styles** and **Colors** list boxes. Note the changes that occur on the **Sample** display. Occasionally, select the **OK** pushbutton to return to the waveform display so you can observe the changes.

18. Select **Options.** When the Options Menu appears, select the **Labels** menu item. The following Label Options dialog box will appear.

Label Options

Title: wfd1~

X Axis: Points

Y Axis: Volts

OK   Cancel
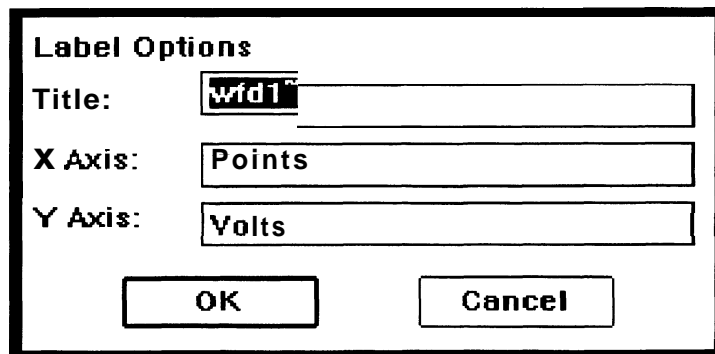
19. You can use the Label Options dialog box to change the title and scale labels on the waveform display. To demonstrate this, click on the entry in one of the edit boxes. Use the BACKSPACE or DEL keyboard keys to remove the entry, then make a new entry. Repeat this for the other two edit boxes, then select the **OK** pushbutton. When the display returns note the changes for the labels that you edited.

Application Hints

Sending Output to a Printer

To send IPG output to a standard DOS compatible printer, first create a variable containing the string of text to be printed, including any control codes. Then create a TRANSFER step to transfer the variable to a file using *LPT1*., *LPT2*., or *PRN*. as the **File Name:** entry (the periods following the printer names are required). This is a DOS feature that allows the printer to be treated as a file. However, if there is another Windows application trying to use the printer at the same time, there may be a printing conflict that mixes the printer inputs together.

Printing a Waveform or IPG Display

To print a waveform display or an IPG display screen, press the PRINT SCREEN keyboard key (On older, non-enhanced keyboards, you may need to press the ALT and PRINT SCREEN keys or the SHIFT and PRINT SCREEN keys simultaneously). This transfers the contents of the display screen to the Windows clipboard.

Next, minimize the IPG window and open the Windows clipboard. Save the clipboard contents into a file. You may then print this file through PC Paintbrush or other graphics editors.

Windows Maximize Function Carryover on View Change

When an instrument front panel view is maximized and you open a new view, the new view will also be maximized and its borders will not be accessible to change the size. To correct this problem, move the mouse cursor to the Title Bar, then click and hold the left mouse button while dragging the view down and to the left. The top and right border of the window will become visible, allowing you to resize the window.

Displaying Multiple Lines of Text in a Display Step

To display multiple lines of text in a display step, separate the lines with a CRLF (<carriage return> cline feed>) sequence, such as:

```
CALCULATE crlf$ = chr$(13)+chr$(10)
CALCULATE a$ = "Line one"+crlf$+"Line two"
Display a$
```

NOTE

A LFCR (cline feed> <carriage return>*) sequence will not produce the same result as the *CRLF* sequence.

Communicating with an Instrument without an ISD Driver File

If an instrument does not have an Instrument Front Panel driver (.ISD file), you can build a simple generic driver to communicate with that instrument. The contents of the generic driver consist of the following:

```
SCRIPT "Generic"
    <bus note>
    END
END
```

where *<bus note>* = GPIB, *RS232*, *VX5520*, or *VXIINTERNAL*, depending upon the type of bus used for communications between the controller and the instrument.

Each of these bus types has default parameters set by IPG, which are listed under the Bus Note Block topic in Section 2, Instrument Script Language Descriptions in the Instrument Front Panel Developers Manual. If these default parameters are not adequate for communications to the instrument, then you need to expand the driver to include the settings for the correct parameters.

After you have built the generic driver, you can communicate with the instrument using the **Transfer Data...** menu item from the Actions Menu. By designating a variable for transmitted data, you can use the **Variable to Instrument...** and **Instrument to Variable...** menu items to create steps that will transfer data to and from the instrument.

Information Exchange Between a Test Program and an Event Handler or an Abort Handler

If you wish to send data to, or return data from, an event handler or abort handle, you must specify some parameters in the declaration of the handler. The test program that is the handler must be created with parameters and the ON EVENT or ON ABORT action must specify the main program variables to send to the handler. An integer specifying RUN/STOP and a string to contain a status message are usually sufficient. The main test program will initialize these variables and if the handler is invoked, it may change the values of these variables. The main test can check the value of the RUN/STOP integer for TRUE or FALSE at any time in the test. If FALSE, the contents of the string variable can be displayed and/or logged to a data file to show the reason the test stopped.

If you have a main test and called subtests, you can still use the handler parameters, but make certain that you pass the handler variables to the called subtest. Be sure to give the formal parameter declaration in the called subtest the same name as the parameters listed in the handler declaration. If the names are the same, when the handler is invoked, the correct values will be sent to the handler. If you do not use the same names, then you will Cause an 'Uninitialized variable' error.

Masking Timeout Errors

You may mask instrument timeout errors in a test program by setting up an `ON EVENT` handler that does nothing for timeouts. IPG will not report a timeout if a timeout handler is enabled. Also, it will not report any errors that may be the result of the timeout. For example, if you ask for a voltage reading from an instrument and no reading is taken, the instrument read will timeout and no data will be returned. The next access to the voltage reading would generate an error. This error will not be reported and the test program will continue. Of course, you may want to do some error processing when the timeout occurs.

A handler that does nothing is simply a test program with only a `BEGIN PROCEDURE` and `END-PROCEDURE` steps. You can create such a test program by building a single `CALCULATE` step test program and then deleting the `CALCULATE` step.

Converting Between Binary Strings and Numbers

The following test procedure illustrates how to convert a string of characters into their binary number representation. This is useful for extracting data from an instrument if it returns binary data rather than ASCII data. The procedure will translate the first two characters of a string into their binary numeric value.

```
PROCEDURE RAWNUM ( )
 PROMPT Enter a two character string
 CALCULATE first$ = mid$(a$,1,1)
 CALCULATE msd& = asc(first$)
 CALCULATE second$ = mid$(a$,2,1)
 CALCULATE lsd& = asc(second$)
 CALCULATE value& = (msd& * 256) + lsd&
 DISPLAY " MSD " + str$(msd&) + " LSD " + str$(lsd&) +
                                " VALUE " + str$(value&)
END-PROCEDURE
```

The following test procedure illustrates how to convert a number to a string of characters representing the binary number. This is useful for sending data to an instrument if it accepts only binary data rather than ASCII data.

The procedure translates a 16 bit integer into a string of two characters. The left most character of the resulting string 'theResult$' will be the most significant byte while the next character will be the least significant byte. After translation the two bytes are displayed as hexadecimal values.

```
PROCEDURE NUMRAWCH (   )
REMARK Ask for a number to convert and place it in value&
   PROMPT Enter a value between 0 and 65535
   CALCULATE msd& = value&/256
   CALCULATE lsd& = mod(value&,256)
   CALCULATE value$ = chr$(msd&) + chr$(lsd&)
   DISPLAY " MSD " + str$(msd&) + " LSD " + str$(lsd&) +
                                   " VALUE: " + value$
CALCULATE msd& = int(value&/256)
   CALCULATE lsd& = value& - (256*msd&)
REMARK The resulting string with the most significant
   byte first is
REMARK stored in string 'theResult$'.
   CALCULATE theResult$ = chr$(msd&)+chr$(lsd&)
   DISPLAY hex$(asc(mid$(theResult$,1,1)))
                 +hex$(asc(mid$(theResult$,2,1)))
END-PROCEDURE
```

Returning Status Information from a .ISD File

Status data may be returned from an instrument driver during program
execution, or interactive use, by using a status control. This control is not
associated with any instrument function, but is used by other controls to
relay additional information to the test program. The status control works
only with `MEASUREMENT` steps, since `SETTING` steps only send data to the
instrument. The status control must come before any controls that use it.

The following is an example of a simple instrument driver that implements
the status control.

```
Script "EXSTATUS"
 GPIB
 End
 View "Main"
  ControlGroup
   Control Status:int CheckBox @ 50,2
    String "Status OK";
    State On;
   End
   Query
Rem You must do something in a Query block
    Status = Status;
   End
  End
  ControlGroup
   Control Volts:float EditBox @2,4
    String"1.0";
    ControlTitle "Volts";
    UpdateList Status;
   End
   Setting
    cont-"Volts:",volts;
```

```
          End
      Query
       cont- "Volts?";
       inst- "VOLTS:",volts;
       if (volts >300) then
        status = 0;
       else
        status = 1;
       endif
      End
     End
     ControlGroup
      Control Amps:float EditBox @20,4
       String "0.1";
       ControlTitle "Amps";
       UpdateList Status;
      End

      Setting
       cont- "Amps:",amps;
      End

      Query
       cont- "Amps?";
       inst- "AMPS:",amps;
       if (amps >30) then
        status = 0;
       else
        status = 1;
       endif
      End
     End
    End
   End
```

The following is an example of a simple test program that uses the status control to determine if the value returned is valid. Notice that the status is returned with a MEASUREMENT step, and that it is the last thing measured.

```
PROCEDURE (untitled) ( )
 MEASUREMENT InstA Volts:volts Status:status&
 IF status& <>1 THEN
  STOP TEST
 ELSE
 END—IF
 MEASUREMENT InstA Amps:amps Status:status&
 IF status&  1 THEN
  STOP TEST
 ELSE
 END—IF
END—PROCEDURE
```

Using I_{PG} as a DDE Server

DDE (Dynamic Data Exchange) is a protocol for communications between MS Windows applications. To use DDE you must write a MS Windows program, using languages such as Visual Basic or ToolBook. You can also use DDE from applications such as Word for Windows and Excel. In the DDE protocol the program providing a service, such as executing TekTMS programs, is called the 'server' while the program requesting the service is called the 'client'.

TekTMS/IPG can be used as a DDE server to run tests, to display a test for editing, or to abort a running test. The DDE client can also query the value of the PassFail variable at the completion of a test.

The details of DDE programs vary with the language the client is written in. This manual does not attempt to explain how to write DDE clients. See the "Microsoft Window Software Development Kit" manuals for the details of writing DDE clients.

TEKTMS.EXE understands the following DDE messages. TekTMS/IPG does not support hot links. For all the DDE messages, TEKTMS.EXE must be loaded.

WM_DDE_INITIATE

This message is sent to "TEKTMS.EXE" to establish a DDE session. The server name specified in the message must be "TEKTMS" and the only supported topic is "RUN-IT".

WM_DDE_EXECUTE

```
[RUNTEST(test name)]
```

This DDE message causes "TEKTMS.EXE" to load and run the PRG file named "*test name.*" The result of the execution can be queried with the WM_DDE_REQUEST message. The main TEKTMS window is not displayed while the test is running.

```
[EDITTEST(test name)]
```

This DDE message causes "TEKTMS.EXE" to load the PRG file named *"test name."*

```
[ABORT]
```

This DDE message causes TEKTMS to abort (stop) the execution of a program started with a "[RUNTEST...]" message.

WM_DDE_REQUEST

```
STATUS
```

This DDE message is used to determine the status of a running TekTMS program. TEKTMS responds with a WM_DDE_ACK indicating "BUSY" if the testing is still running. If the test has completed it returns "PASS" if the

PassFail global variable is TRUE, "FAIL" if it is FALSE and "INCOMPLETE" if the test was aborted. The status is passed as a zero terminated string in global DDE shared memory, with its handle as the low order word of the long word parameter of the message.

WM_DDE_TERMINATE

When TEKTMS receives this message it closes the DDE session. If a program is currently running it is not stopped.

Appendices

Appendix A:
Editing Menu Items

This section provides a reference list of all editing menu items, and a description of the actions they perform.

Undo — reverses the edit action of the most recent Edit Menu command. If you repeatedly select the **Undo** command, IPG switches between the current edit state and the previous edit state. (For example, if you have inserted a word, the first **Undo** command removes it, while the second **Undo** replaces it.) **Undo** is enabled only when an edit action that can be reversed exists.

Cut — copies highlighted text to the clipboard, and deletes it from the procedure. When you highlight a single action statement of a multiple statement test procedure action (such as one of the IF, THEN, or ELSE statements from an IF-THEN-ELSE construct), **Cut** copies all of the action statements of the construct to the clipboard, then deletes the statements from the procedure. However, text added between the action statements is neither copied nor deleted. If you wish to delete the text, you must highlight and delete it separately.

Copy — copies highlighted text to the clipboard without deleting it from the procedure. When you highlight a single statement of a multiple statement test procedure action (such as one of the IF, THEN, or ELSE statements from an IF-THEN-ELSE construct), **Copy** copies all action statements of the construct to the clipboard. However, text added between the action lines is not copied. If you wish to copy the text, you must highlight and copy it separately.

Paste — copies the contents of the clipboard to the test procedure ahead of the currently highlighted line.

Clear — deletes a highlighted item, but does change the contents of the clipboard.

Enable Selected Steps — reverses the action of the following **Disable Selected Steps** command.

Disable Selected Steps — allows you to leave a step in a procedure, but to disable it so that the procedure will not act upon it when run.

Appendix B:
DEMOTEST.PRG Program

This appendix contains a copy of the OUTLINE and FULL listings for DE-MOTEST.PRG, which is an executable IPG test procedure contained on the IPG Program Disk(s). Also, it the same test procedure described in Section 6, Advanced Applications. When the test system and unit under test (UUT) described in Section 6 are available, this program can be loaded and run.

The numbers on the listings are keyed to the tutorial step numbers in Section 6 that explain how to create each test procedure step. These numbers also correlate between the OUTLINE and FULL listings.

These listings were retyped into this manual and vary slightly from those that were printed on the test system where the procedure was generated. The differences are:

- In the FULL listing, the page break occurred at a different place in the program listing.

  The following line in the program went to a new line at a different place:

  ```
  CALCULATE report$ = report$+"Test "+str$(index&)+
  " Stimulus "+freq$+" Hz "+str$(output)+" ACV RMS"
  +chr$(13)chr$(10)
  ```

_____

DEMOTEST.PRG Outline Form

```
1    TekTMs                           DEMOTEST                                  Page 1
     dmm            TDM5120.ISD       GPIBO             PRI 16
     fg             TEKFG.ISD         GPIBO             PRI 24
3    PROCEDURE DEMOTEST ()
2    REMARK Locate R3 Gain Adj and preset it.
4       PROMPT PICTURE TEKPIC.BMP
        PROMPT Set R3 Gain Adj to midrange.
5    REMARK Initialize instruments for tests to follow.
6       SETTING fg SINEWAVE FREQUENCY CONTINUOUS AMPLITUDE OUTPUT
        SETTING dmm acvthree acvrange
7    REMARK Adjust R3 Gain Adj to its nominal value.
8       ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4
9         MEASUREMENT dmm acvreading:gaincal
8       END-ADJUSTMENT
10   REMARK Initialize test procedure variables.
11      CALCULATE index& = 0
        CALCULATE testdatetime$ = date$()+" "+time$()
        CALCULATE report$ = testdatetime$+chr$(13)+chr$(10)
12   REMARK Test the frequency response from 10 Hz to 100 kHz.
13      FOR freq = 10 to 1.0E+5 STEPS 21 LOG
14   REMARK Set the Function Generator frequency to "freq$".
15        CALCULATE freq$ = str$(freq)
16        SETTING fg FREQUENCY:freq$
17   REMARK Delay for DMM range change.
18        DELAY 300 MILLISECONDS
19   REMARK Measure the UUT output
20        MEASUREMENT dmm acvreading:output
21   REMARK Build formatted report string.
22        CALCULATE index& = index&+1
23        CALCULATE report$ = report$+"Test "+str$(index&)+" Stimulus "+freq$...
13      NEXT
24   REMARK Power down and reset instruments.
25      PROMPT Turn off the power supply to the UUT.
26      SETTING fg OUTPUT
        SETTING dmm acvrange
27   REMARK Log report string to disk file.
28      TRANSFER report$ -> demotest.DAT
29   REMARK Display report.
30      DISPLAY report$
2    END-PROCEDURE
```

DEMOTEST.PRG Full Form

```
1    dmm              TDM5120.ISD      GPIB              PRI 16
     fg               TEKFG.ISD        GPIB              PRI 24
3    PROCEDURE DEMOTEST ()
2    REMARK Locate R3 Gain Adj and preset it
4      PROMPT PICTURE TEKPIC.BMP
       PROMPT Set R3 Gain Adj to midrange.
5    REMARK Initialize instruments for tests to follow.
6      SETTING fg
         SINEWAVE "FUNC SINE;"
         FREQUENCY "1000"
         CONTINUOUS 1
         AMPLITUDE " 1.0"
         OUTPUT "OUT ON:"
       SETTING dmm
         acvthree 1
         acvrange "3"
7    REMARK Adjust R3 Gain Adj to its nomin al value.
8      ADJUSTMENT gaincal LOW 3 NOMINAL 3.6 HIGH 4 gainpf
         Adjust R3 to its nominal value.
9        MEASUREMENT dmm
           acvreading gaincal
       END-ADJUSTMENT
     REMARK Initialize test procedure variables.
       CALCULATE index& = 0
       CALCULATE testdatetime$ = date$()+" "+time$()
       CALCULATE report$ = testdatetime$+chr(13)+chr$(10)
12   REMARK Test the frequency response from 10 Hz to 100 kHz.
13     FOR freq = 10 TO 1.0E+5 STEPS 21 LOG
14   REMARK Set the Function Generator frequency to "freq$".
15       CALCULATE freq$ = str$(freq)
16       SETTING fg
           FREQUENCY freq$
17   REMARK Delay for DMM range change.
18       LAY 300 MILLISECONDS
19   REMARK Measure the UUT output.
20       MEASUREMENT dmm
           acvreading output
21   REMARK Build formatted report string
22       CALCULATE index& = index&+1
23       CALCULATE report$ = report$+"Test "+str$(index&)+" Stimulus "
         +freq$+" Hz "+str$(output)+" ACV RMS"+chr$(13)+chr$(10)
```

```
13    NEXT
24  REMARK Power down and reset instruments.
25    PROMPT Turn off the power supply to the UUT.
26    SETTING fg
         OUTPUT "OUT OFF;"
      SETTING dmm
         acvrange "AUTO"
27  REMARK Log report string to disk file.
28    TRANSFER report$ -> demotest.DAT
29  REMARK Display report.
30    DISPLAY report$
         Frequency vs Gain Data for MYTEST.PRG.
      END-PROCEDURE
```

Appendix C:
Software Performance Report

This Software Performance Report is for your use in reporting any problems you experience when using TekTMS/IPG. It provides us with a way to track problems with a particular system and it ensures that we provide you and other customers with a prompt solution to the problem. Please supply the following information:

Customer (Company Name): _____

User (Person making report): _____

Address: _____

City: _____ State: _____ Zip: _____

Country: _____ Telephone: _____

System Description (Product Name, S/W Version, Serial Number): _____

Product Name: _____ PC Model/Make: _____

Version: _____ DOS Version: _____

Serial No: _____ Windows Version: _____

Other Software (TSR's, ...)

Problem Description: _____

_____

_____

_____

_____

(If possible, include exact steps to recreate the problem.)

Itemize attached documentation (i.e., listings, diskettes, ...)

Mail the report to:

> Tektronix, Inc.
> Instrument Controllers and Software Marketing Dept.
> MS 47-665
> P.O. Box 500
> Beaverton, OR 97075-9965

Or FAX to:

> (503) 627-2933

Marked for ICS Marketing, 47-665

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