Model 360B
Vector Network Analyzer
Instrument Driver
for LabWindows

User's Guide

Version 1.00

Serial Number

You will be asked for this number when you call ANRITSU Customer Service for support.

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Preface

The 360B LabWindows Instrument Driver User's Guide provides a tutorial and both general and detailed descriptions of the various functional panels displayed in the LabWindows environment. The user should be familiar with measurements using the applicable ANRITSU instrument and with MS- or PC-DOS conventions. A knowledge of LabWindows, while helpful, is not essential. The ANRITSU Instrument Drivers software can be used to create executable stand-alone application programs.

Manual Organization

The manual is divided into three sections:

Section 1, General, provides general information and a tree structure for the Instrument Driver function panels.

Section 2, Using the 360B Driver with LabWindows, provides description and a tutorial for using the driver within the LabWindows environment.

Section 3, Driver References, provides detailed descriptions of the function panels and instrument controls. It also provides sample syntax and a listing of variable-type used in the program.

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Section 1

Introduction to the 360B Vector Network Analyzer (VNA) Driver for LabWindows

Section 1
Introduction to the 360B Vector Network Analyzer (VNA) Driver for LabWindows

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General

ANRITSU Instrument Drivers software provides an easy-to-use tool for developing application programs for applicable microwave systems via the General Purpose Interface Bus (IEEE-488 Bus).

This software contains modules that automatically configure an applicable ANRITSU instrument for use on the bus, along with high-level instrument control commands that save you the time required to learn and program the GPIB commands of the instrument. The software automatically checks for proper bus functioning. If a command is sent to a bus instrument and no error is reported, the bus can be assumed to be working correctly.

Requirements

The ANRITSU Instrument Driver software is written specifically for the model 360B VNA. However, it may also be used with earlier Model 360 VNAs with the exception of a small number of functions.

The ANRITSU Instrument Driver requires an IBM PC AT, PS/2, or compatible computer running MS- or PC-DOS, Version 3.0 or later.

The software is delivered on 5-1/4 inch 1.2 Mb Floppy disks and 3-1/2 inch 1.4 Mb floppy disks.

At least 2 MB of memory is required to run the LabWindows program — 4 Mb is recommended.

The ANRITSU Instrument Driver software requires National Instruments LabWindows version 2.2 or later.

For Microsoft QuickBASIC, Professional BASIC, Visual BASIC for DOS, C, Quick C, and Borland C++ and Turbo C++ users, you can use the 360B Instrument Driver software to produce compatible instrument-control-program code.

Installing Instrument Drivers

This section provides instructions for installing the ANRITSU Instrument Drivers. Proceed as follows:

- ☐ Insert the ANRITSU driver diskette in your A: or B: drive, as appropriate.
- ☐ Change to the LabWindows, Instruments directory (*drive*\LW\INSTR), and type the following DOS command: COPY A: (B:) *.*. This copies the following eight files to the target subdirectory: W360B.LBW, W360B.LWI, W360B.FP, W360B.DOC, W360BCAL.LBW, W360BCAL.LWI, W360BCAL.FP, W360BCAL.DOC (All of these files MUST reside within the same subdirectory.)
- ☐ Once the copying is completed, return the driver diskette to a safe storage location.

Overview For LabWindows Users

LabWindows is a software development system for BASIC, C, and C++ programs (see page 1-3 for listing of supported languages). It contains an interactive environment for developing programs with drivers and libraries (functions) for creating data acquisition and instrument control applications. LabWindows contains a comprehensive set of software tools for data analysis, data presentation, and high level instrument control.

The interactive program is an environment for editing and debugging BASIC and C (C++) programs. In the LabWindows environment, you can use the functions in the instrument drivers or libraries to write your program. In addition each function has an interface called a function panel that lets you interactively execute the function or generate code for calling the function.

The interactive program uses extended memory. Programs executed in the interactive program can use up to 16 megabytes of memory, depending on your computer configuration. Programs that run in the interactive program, however, must adhere to the LabWindows subsets for BASIC, C and C++.

Programs developed with the drivers and library functions can be run within the interactive program, or they can be compiled and linked into a stand-alone applicaton (*.EXE) or run-time application (*.RTM) file. To help you create a stand-alone program, LabWindows incorporates utilities that automate the compile and link processes.

The real power of LabWindows lies in the libraries. They have functions for developing all phases of your data acquisition and instrument control system. For controlling the 360B , Lab Windows has the Instrument Drivers Library. Programs that call this library can be developed with the interactive program. This program has tools that make program development quicker and easier.

LabWindows gives you the capability to execute instrument drivers with the aid of panels and thereby create programs easily. The panels contain items that can be selected to build and execute a driver. The drivers are separately declared in the Instrument Drivers Library.

Two advantages of using LabWindows are:

- ☐ When writing an application program you do not have to remember all of the parameters that belong to the driver.
- ☐ Error reporting is shown automatically in the panels.

Overview for Non-LabWindows Users

Programmers who do not use LabWindows will also benefit from the ANRITSU Instrument Driver software:

- ☐ You will not have to know all of the GPIB codes needed to program applications for the 360B VNA. The driver software effectively manages low-level GPIB I/O operations and native instrument control.
- ☐ You will see greater program reliability because of the driver's extensive error-checking routines.
- ☐ You will see reductions in the time required to develop, test, and debug applications.

Section 2

Using the 360B Instrument Driver with LabWindows

Section 2
Using the 360B Instrument Driver with LabWindows

Introduction

This section provides an introduction to the LabWindows environment and a tutorial describing the use of the 360B driver within LabWindows. This section assumes that you have read Part 1 of the National Instruments *Getting Started with LabWindows* manuals and are generally familiar with the LabWindows screen and principles of navigation within the environment.

The 360B driver consists of two separate instrument modules. The first, W360B.FP, contains all of the general setup, display, analysis, and I/O functions. The second, W360BCAL.FP, contains all of the vector error correction, or calibration, setup and measurement functions.

General

The following procedure describes how to access LabWindows and load files.

- ☐ Move to the directory containing the LabWindows executable (*.EXE) files. (This directory is usually named \LW.)

- ☐ Type LW.
  This places you in the PROGRAM window of the LabWindows environment (below).

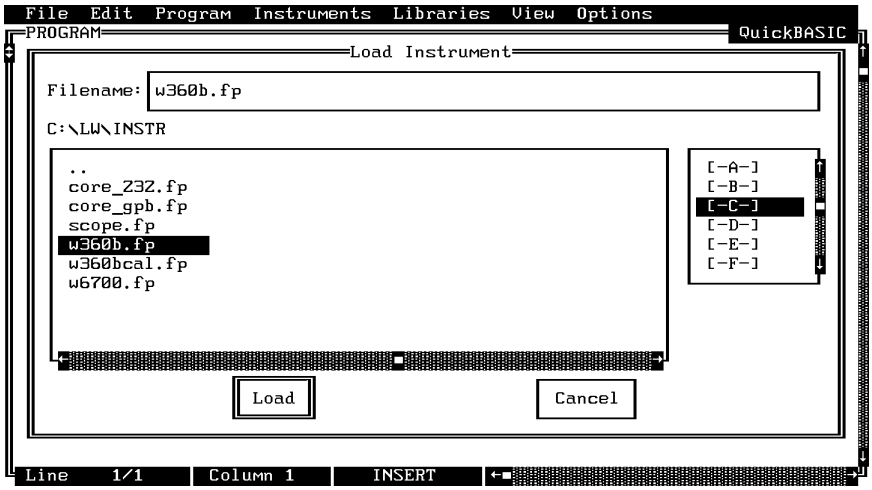
Loading 360B Driver as Instrument Module

The following procedure describes how to load the 360B Driver instrument module.

☐ Select **Instruments,** on the top menu bar (below), to display the pull-down menu.

Select **Load,** then change to the \LW\INSTR subdirectory (below).

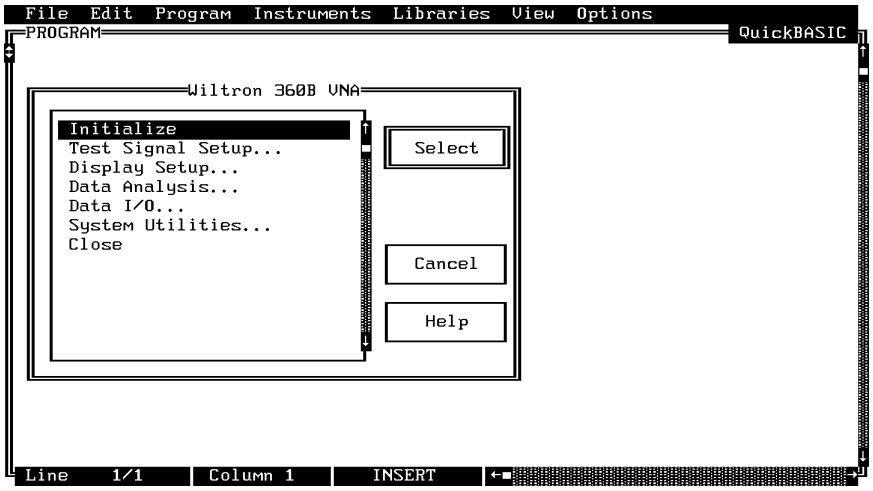
☐ Move the cursor to **w360b.fp** and select **Load.**



☐ Repeat the previous two steps to load the **360bcal.fp** file.

☐ Move the cursor to Instruments to display the pull-down menu. The "ANRITSU 360B VNA" and "ANRITSU 360B VNA Calilbration" titles display, showing that the instrument modules are now loaded.

☐ Select **ANRITSU 360B VNA,** and observe that the 360B main panel appears (below). This panel contains all of the signal, display, analysis, and I/O setup functions for the 360B VNA.



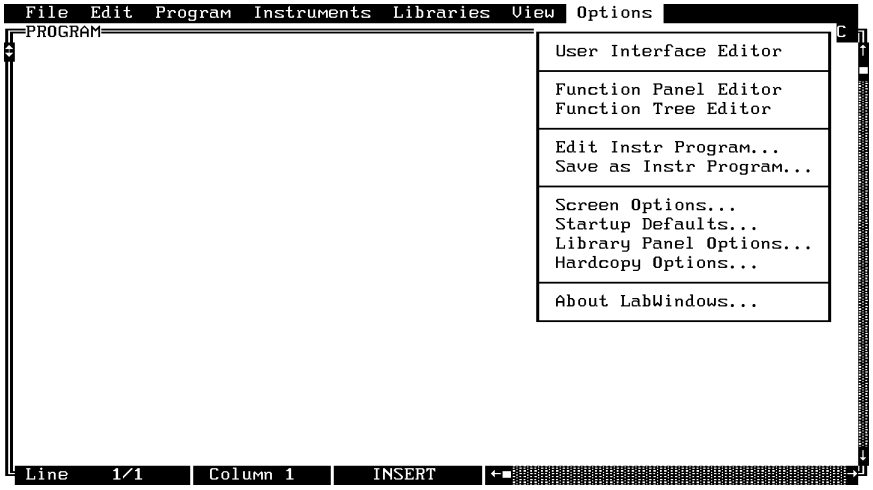
☐ Repeat the above two steps for the **ANRITSU 360B Calibration** module.

☐ You are now ready to proceed with developing control code using the 360B VNA instrument driver.

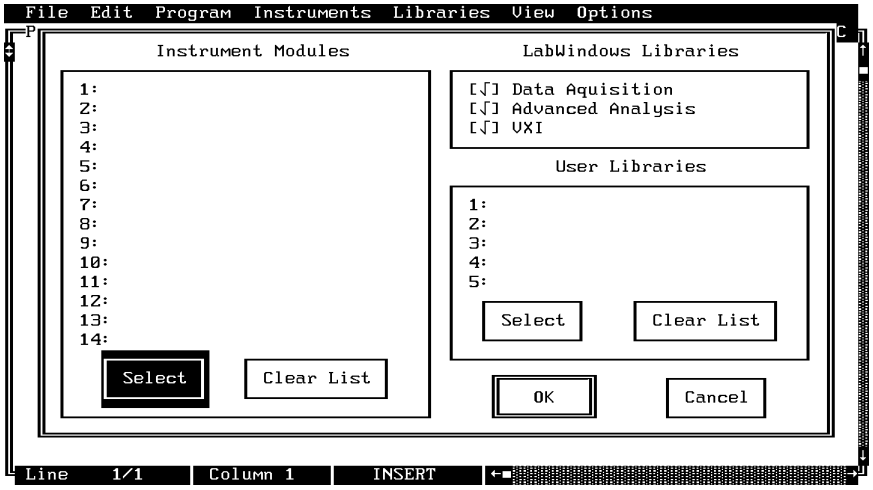
Loading 360B Driver At Start-up

The 360B driver can be automatically loaded each time LabWindows is started. The procedure for making this happen is given below.

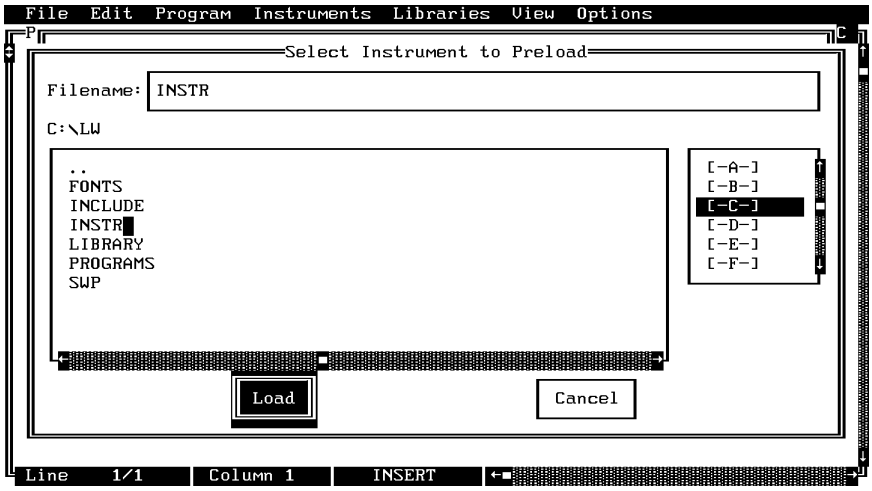
- ☐ Place yourself into the LabWindows PROGRAM window as was described on page 2-3.
- ☐ Select Options, on top menu bar, to display the pull-down menu.



- ☐ Select **Startup Defaults.**
- ☐ Choose **Select** to locate the 360B VNA driver (W360B.FP and W360BCAL.FP); alternatively, type in the path and file names.

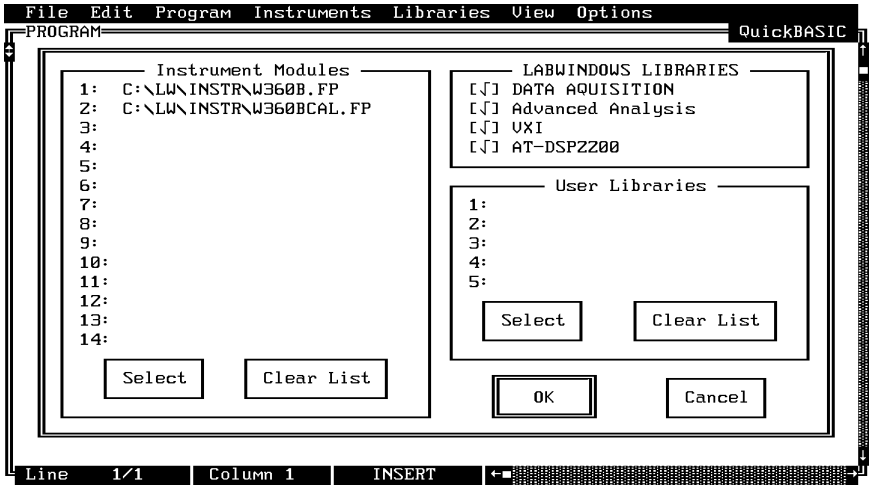


☐ Choose the **\LW\INSTR** subdirectory from the file list.



☐ Choose W360B.FP from the displayed file list, and click on **Load.**

☐ Repeat the above process for the W360BCAL.FP file.

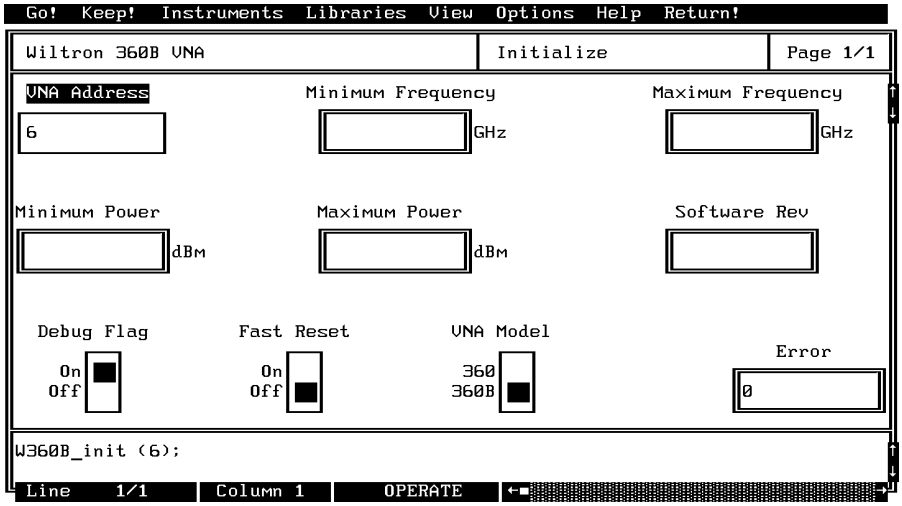


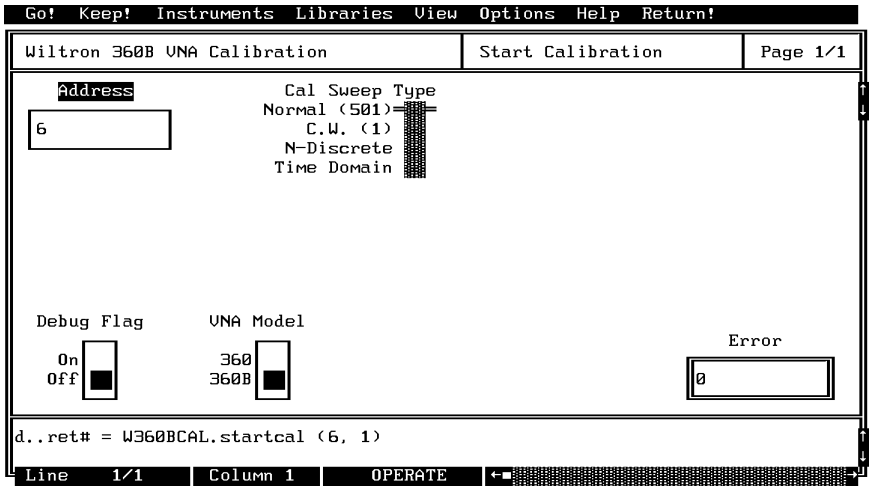
☐ The appropriate paths will now be displayed in the INSTRUMENT MODULES window. Select **OK** to exit. The W360B and W360BCAL drivers will now be loaded automatically each time LabWindows is started.

Debug Utility

The 360B LabWindows drivers incorporate a unique Debug utility. This utility provides enhanced real-time error checking when the Debug Flag function is enabled within the program (debug%=1).

During program development: When the **Debug Flag** switch in the Initialization panel (W360B.FP) or the Start Calibration panel (W360BCAL.FP) is set to On and an instrument-specific error is detected, it returns one of error codes shown on the next page.





- ☐ 300 - No GPIB Response
- ☐ 301 - Parameter Range Error
- ☐ 302 - No Valid Memory Trace
- ☐ 303 - Invalid file name
- ☐ 305 - Unexpected SRQ
- ☐ 306 - No valid user defined parameters
- ☐ 310 - Internal disk drive error
- ☐ 311 - Self Test Failed
- ☐ 312 - Hardware error
- ☐ 314 - Action not possible

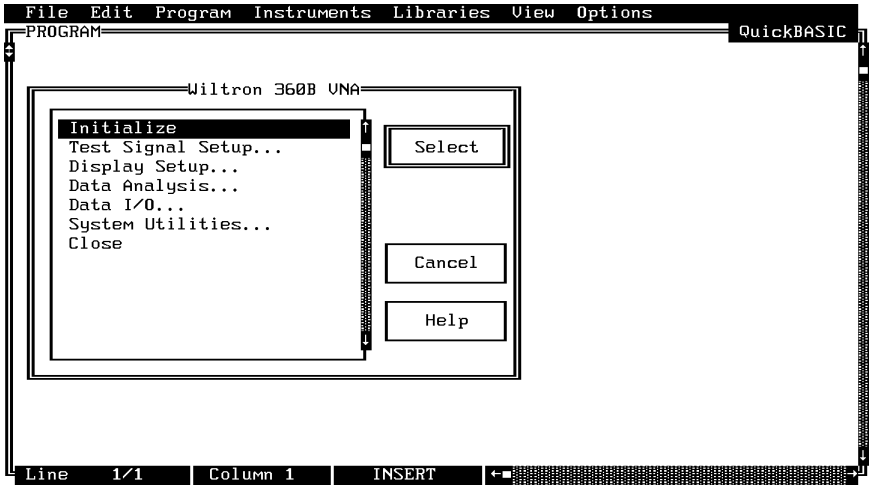
When the Debug Flag utility is off (DEBUG=0), *no instrument-specific error messages are returned* (except for 305).

When the function is set to on, execution of the program is slowed. Its use adds 300 ms to the execution of each command string. Consequently, we recommend that it be enabled only during program development, and that it be disabled before the program is compiled.

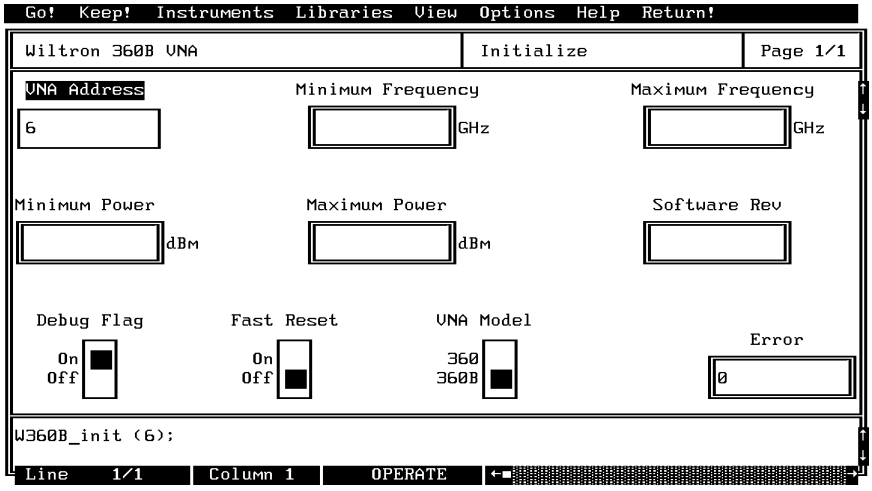
Tutorial

This tutorial takes you through the development of a simple program. This program initializes the 360B VNA, defines a step frequency sweep, sets power levels, performs a frequency response calibration, configures the S-Parameter display, and outputs trace data to a memory array and a disk file (TEST.WTR). When you have finished stepping through the tutorial, you will have a BASIC program that can be compiled as a DOS executable (*.EXE) file. A Microsoft C program could be produced in the exact same manner by switching the native language to C (under the **Program** menu).

☐ Move cursor to **Instruments** in the top menu bar, and select **ANRITSU 360B VNA.** This will display the main instrument menu shown below.



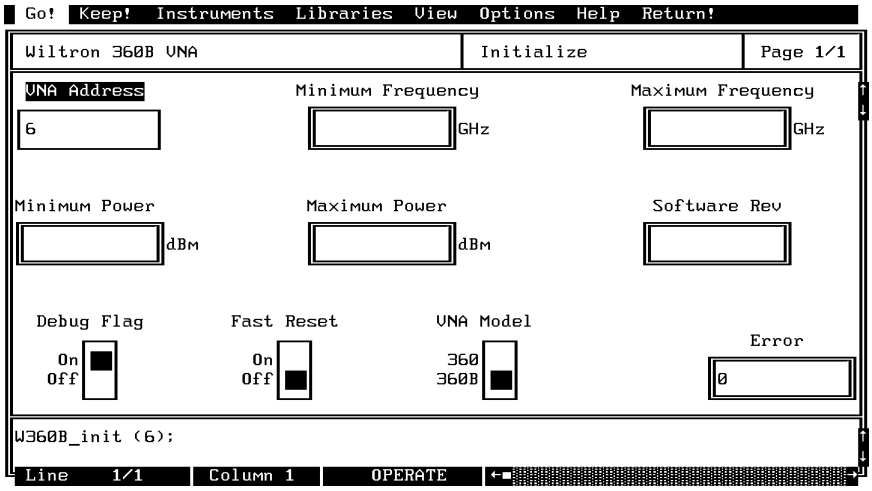
☐ Choose **Select** to display the Initialize panel (below).



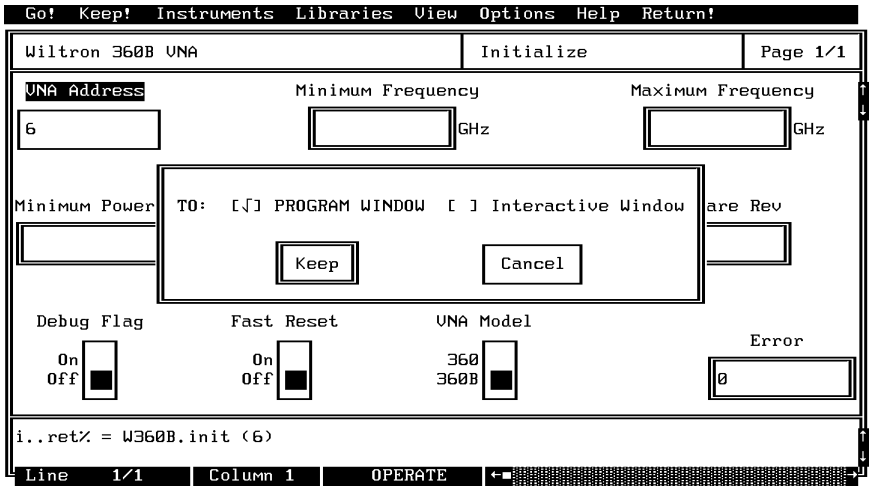
☐ With the **VNA Address** highlighted as shown, enter the 360B VNA address (a number between 1 and 30; 6 is the default).

☐ Select **Go!** (below) in the top menu bar. If a 360B is connected and set to GPIB address 6, it will respond by resetting itself and returning an identification string that will fill the **Minimum Frequency, Maximum Frequency, Miniumum Power, Maximum Power,** and **Firmware Rev** fields.

☐ Leave the **Debug Flag** and **Fast Reset** switch set to Off. The Debug Flag switch is discussed on page 2-8, Fast Reset is discussed on page 3-32.

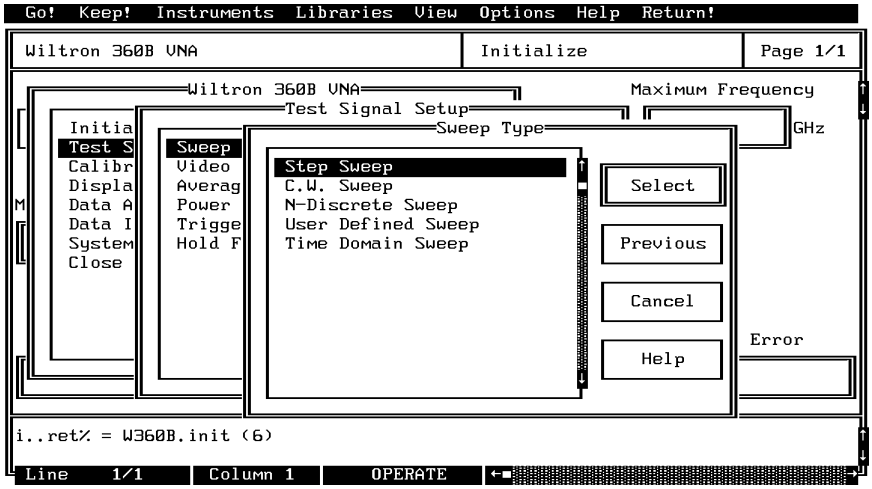


☐ Move the cursor to **Keep!**, in the top menu bar, then choose **Keep** from the next window (below) to select the default option. This transfers the code shown at the bottom of the panel to the PROGRAM window of the LabWindows environment.



☐ Select **Instruments,** in the top menu bar, then **360B VNA** to return to the 360B Driver main panel.

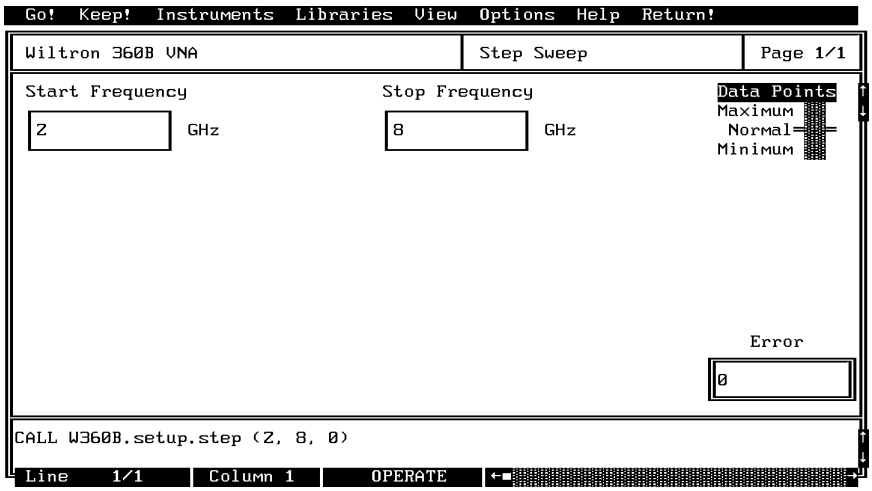
☐ Select **Test Signal Setup,** from the main menu, then **Sweep Type,** and **Step Sweep** from the follow-on menus as they appear (below).



☐ Select **Start Frequency** (below)**,** and enter **2** from the keyboard.

☐ Select **Stop Frequency,** and enter **8** from the keyboard.

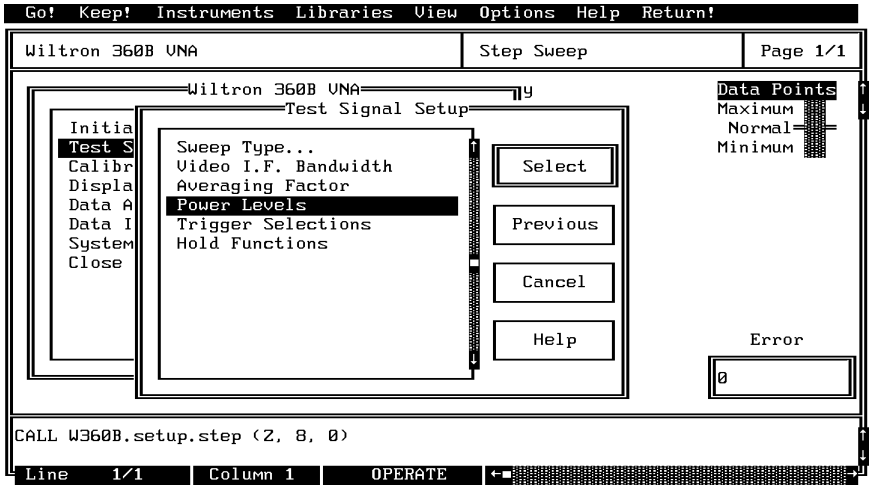
☐ Select **Normal**, from the **Data Points** control.



☐ Select **Keep!**, in the top menu bar; then choose **Keep** again when the next menu appears.

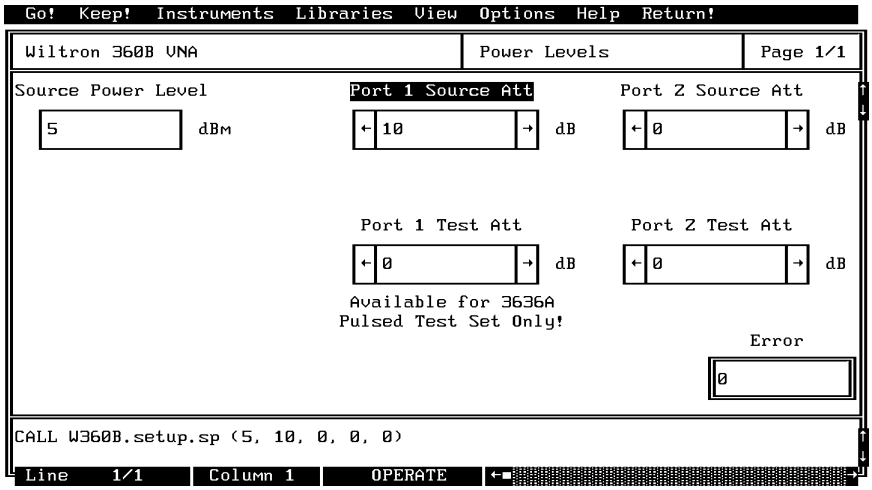
☐ Select **Instruments,** in the top menu bar, then **360B VNA** to return to the 360B Driver main panel.

☐ Select **Test Signal Setup** and **Power Levels** from the next menus to appear (below).



☐ Select **Source Power Level** (below), and enter **5** from the keypad.

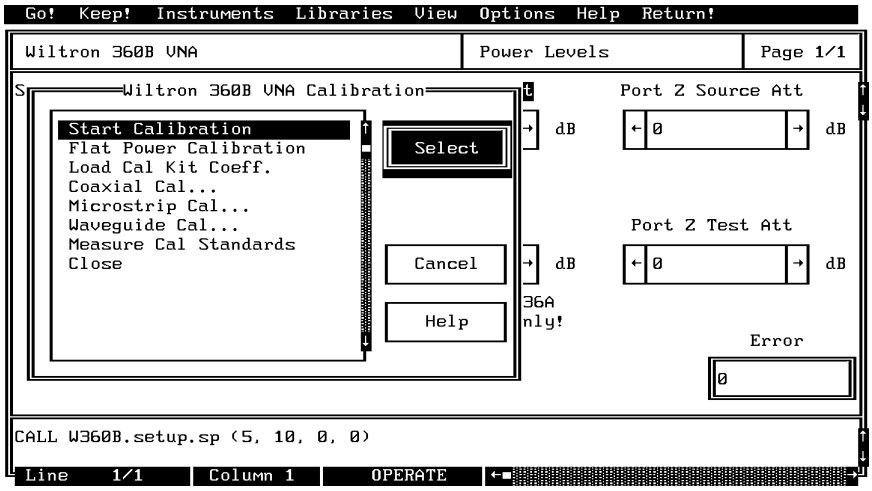
☐ Select **Port 1 Source Att,** then click on the right arrow (→) key or control to select 10 dB. Note: If you do not have a Model 361XA Active Device Test Set, leave Port 1 Source Att set at 0.



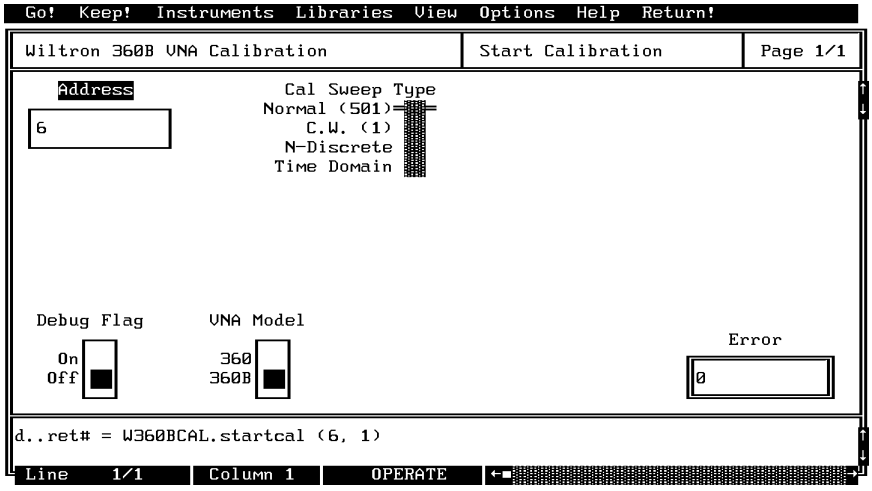
☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA Calibration** to display the calibration driver main panel.

☐ Select **Start Calibration** (below) to display the Start Calibration menu.



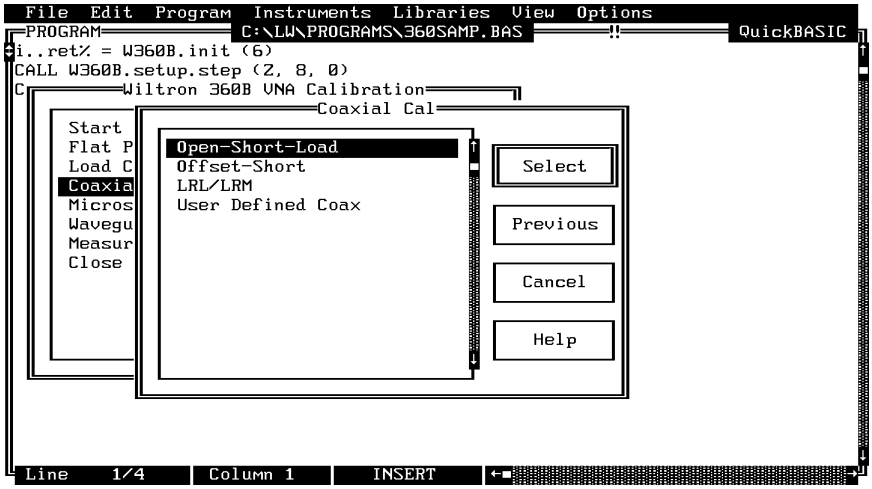
☐ Verify that the **Address** is set to **6** and the **Calibration Sweep Type** control is set to **Normal (501)** (this setting corresponds with the normal step sweep (2–8 GHz) defined in a previous step).



☐ Select **Keep!,** from the top menu bar, and then **Keep** again to add the code to your program.

☐ Select **Instruments,** in the top menu bar, then **360B VNA Calibration** to display the calibration driver main panel.

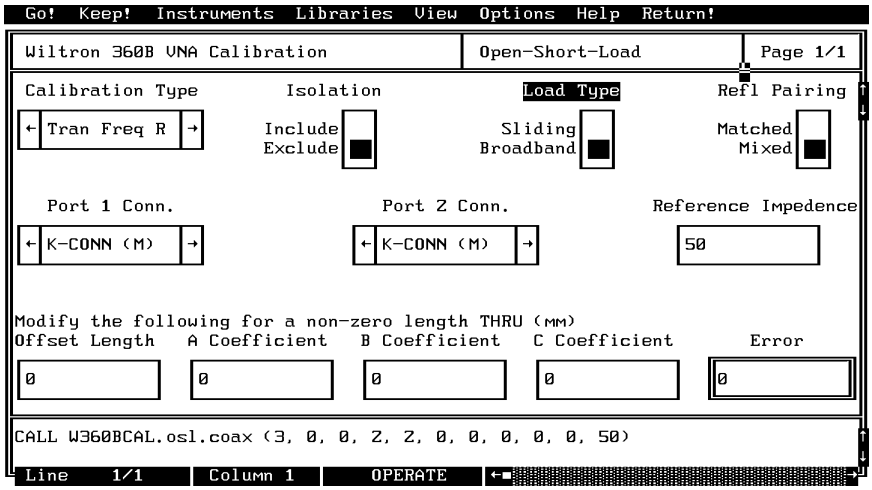
☐ Select **Coaxial Cal** then **Open-Short-Load** from the next menus to appear.



☐ In the **Calibration Type** field, use left or right arrow key to select **Trans. Freq. R** (below).

☐ Select **Exclude** from the **Isolation** control.

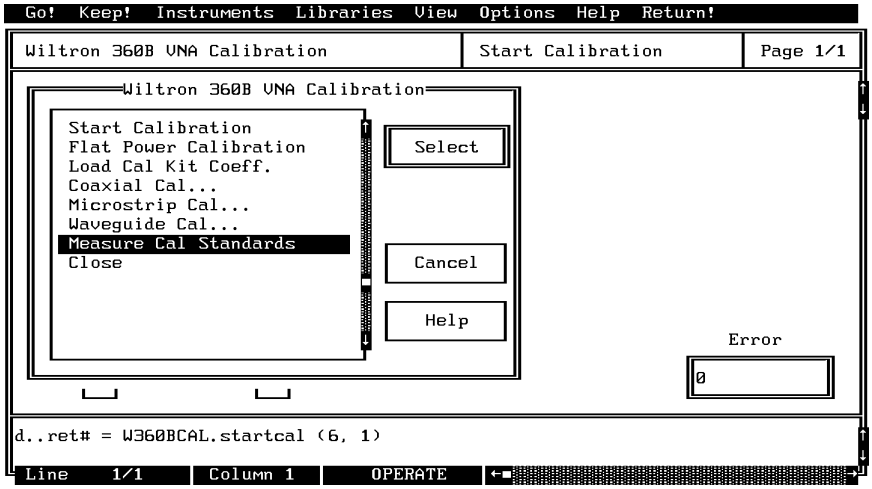
☐ **Load Type, Reflection Pairing, Test Port Connectors,** and **Reference Impedance** fields are left at their default values, as they are not relevant to the transmission frequency response calibration.



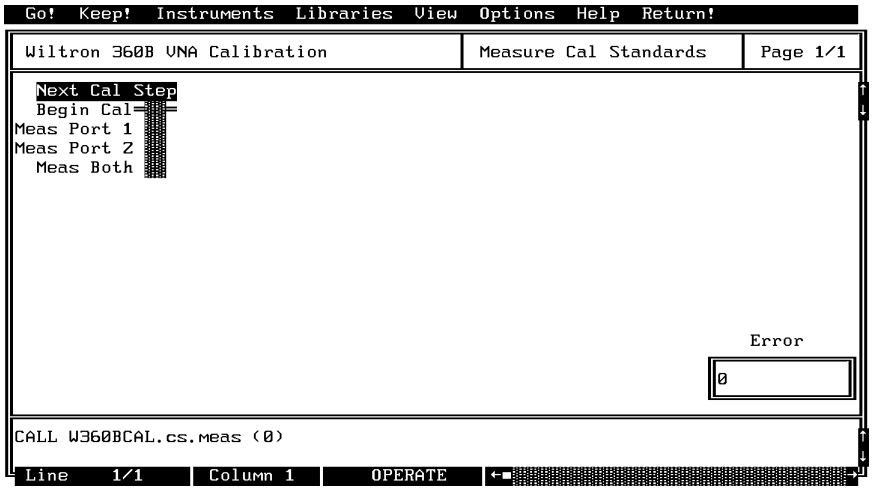
☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA Calibration** to return to the calibration driver panel.

☐ Select **Measure Standards** from the main calibration driver panel (below).



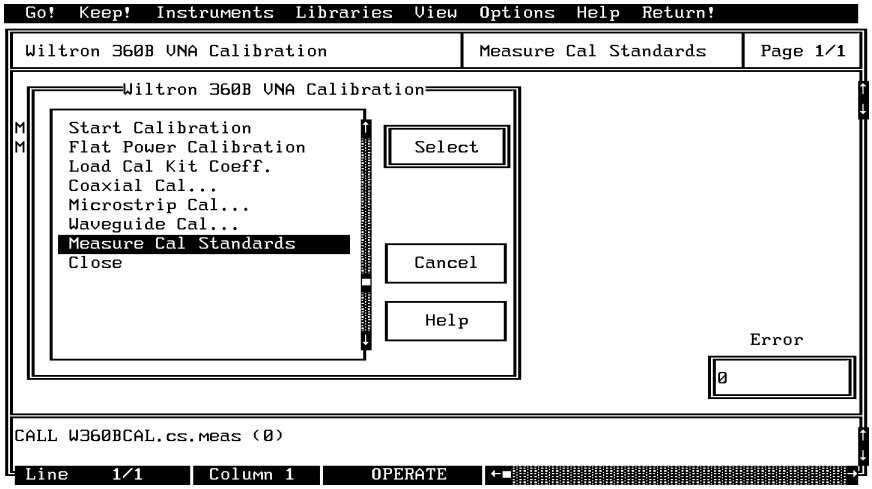
☐ Select **Begin Cal** on the **Next Cal Step** slide switch (below).



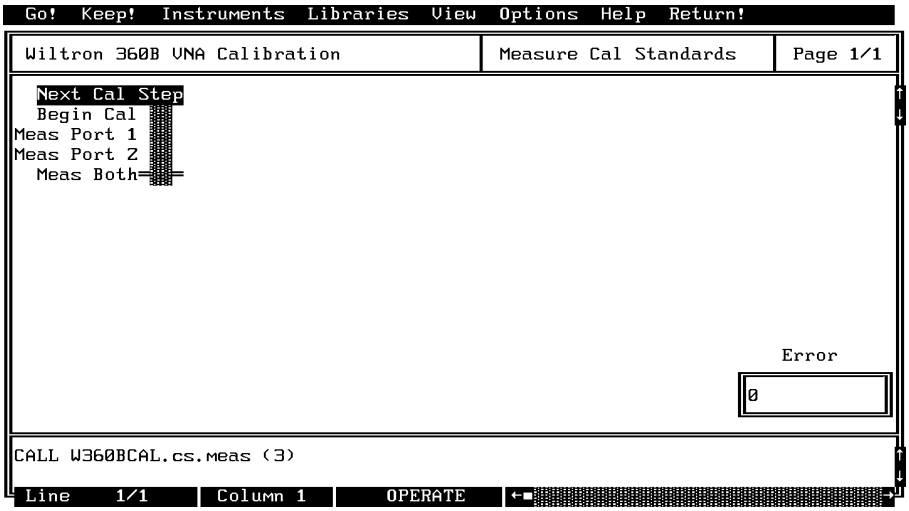
☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA Calibration** to return to the calibration driver panel.

☐ Select **Measure Standards** from the main calibration driver panel (below).



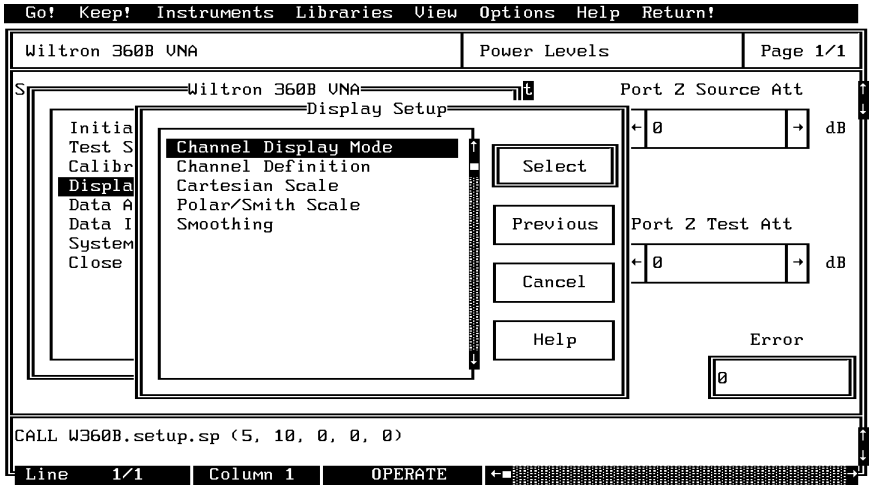
☐ Select **Meas Both** on the **Next Cal Step** slide switch (below).



☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA** to return to the main 360B VNA driver panel.

☐ Select **Display Setup** then **Channel Display Mode** (below) to display the Channel Display Mode panel (next menu).

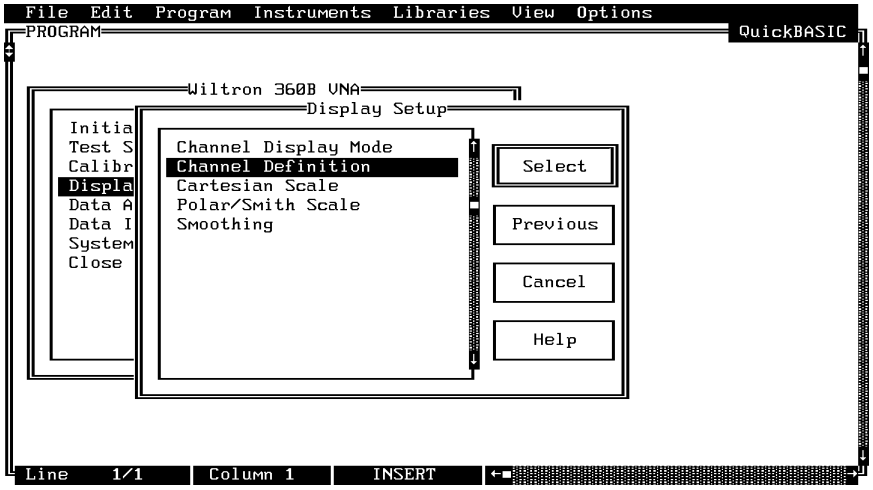


☐ Select **Single Chan** from the **Display Channel** control (below).

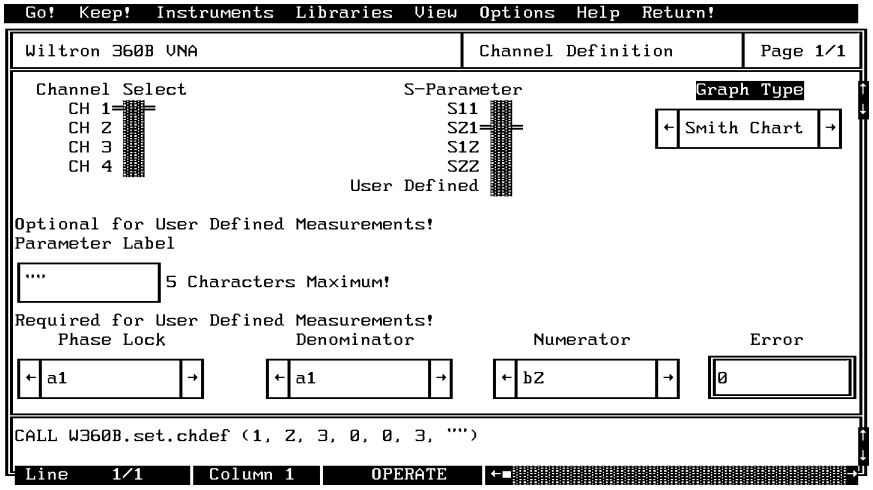
☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA** to return to the main driver panel.

☐ Select **Display Setup** then **Channel Definition** (below) to display the Channel Definition panel (next menu).



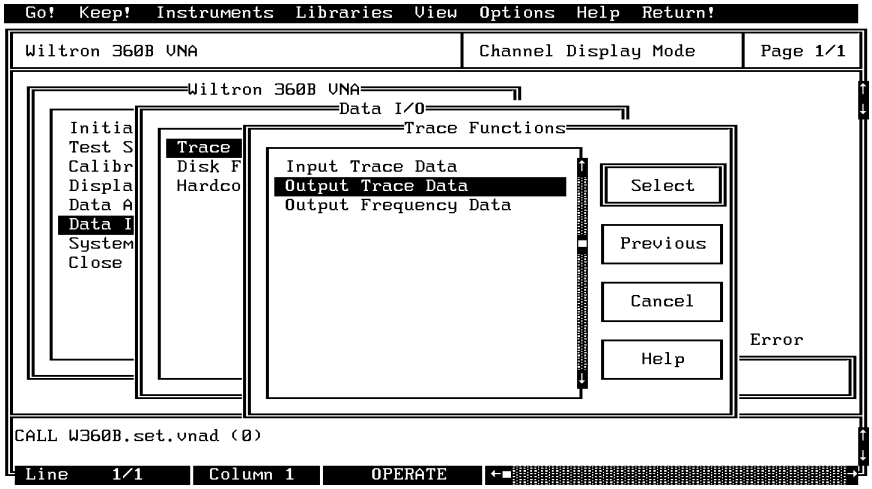
☐ Select **CH1** and **S21** from the appropriate controls on the menu shown below, then click twice on the right arrow (→) key or control to select **Smith Chart**.



☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA** to return to the main driver panel.

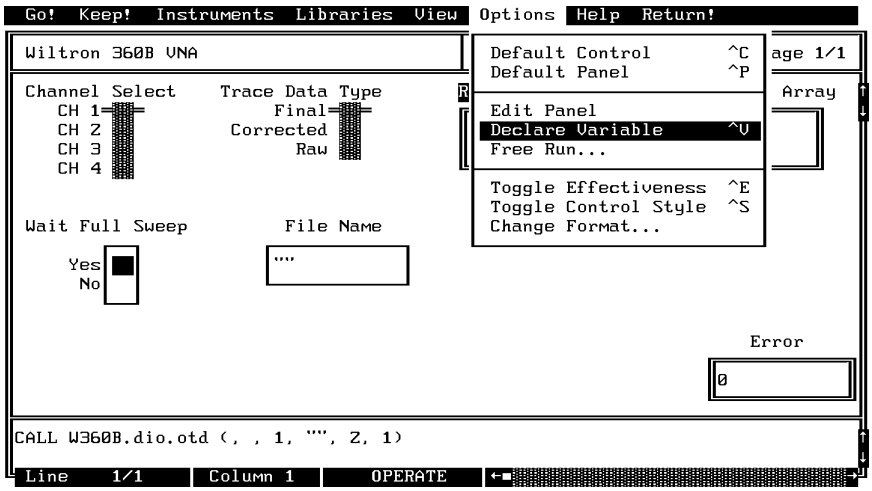
☐ Select **Data I/O,** from the main menu, then **Trace Functions,** and **Output Trace Data** from the follow-on menus as they appear (below).



☐ Select **CH1** and **Final Data,** from the appropriate controls on the menu shown below**.**

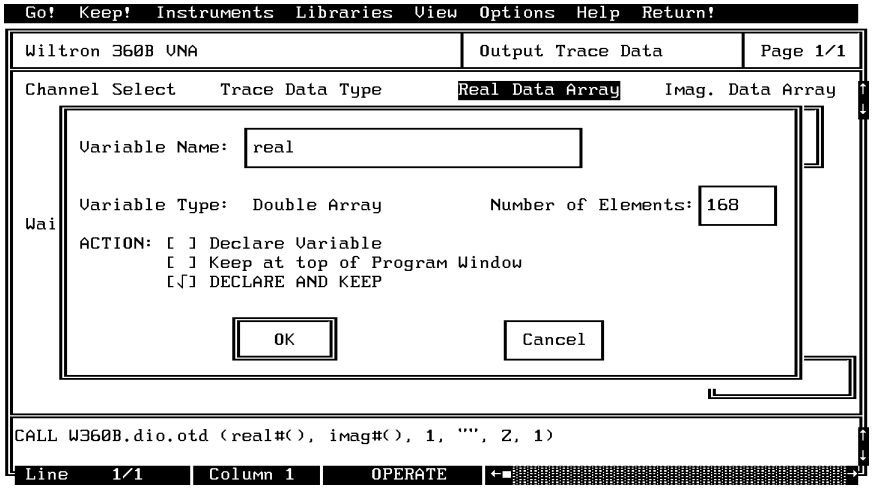
☐ Next, you must declare two arrays that will hold the real and imaginary portions of the trace data output from the 360B.

☐ Select the first array by highlighting the **Real Data Array** and selecting **Options,** from the top menu bar. Then select **Declare Variable** from the drop-down menu.

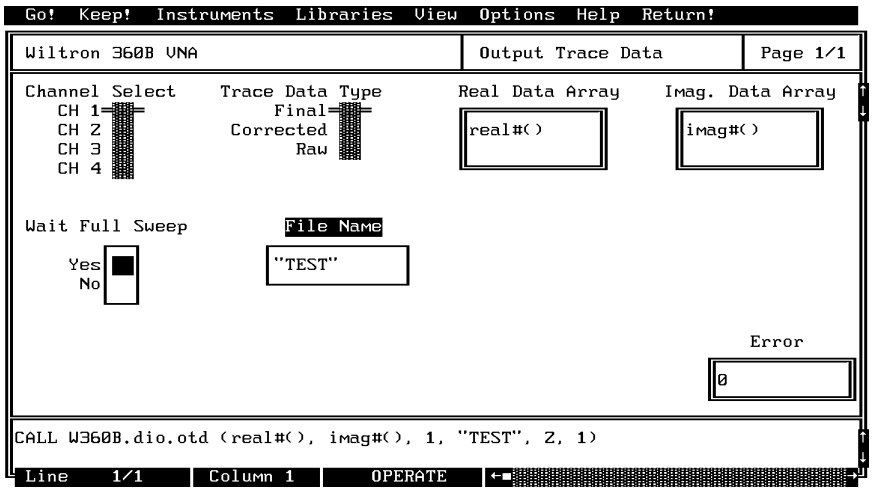


☐ Enter the array name (real#() in this example) in the **VARIABLE NAME:** window, and 168 in the **NUMBER OF ELEMENTS:** window. (This value reflects the number of data points in the step sweep.)

☐ Select the **Declare and Keep** option, then **OK** (below). This will allocate the array in memory and write the appropriate dimension statement to the PROGRAM window.



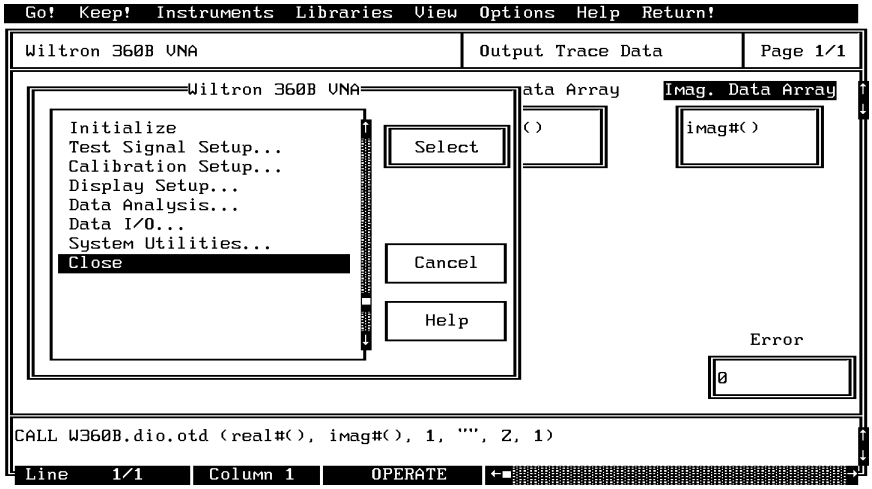
☐ Repeat the above process for the Imaginary Data Array. After declaring imag#() array, the cursor moves to the **Wait Full Sweep** control. Select **Yes,** then enter `"TEST"` in the **File Name** field. The panel below shows the correct control entries and settings.



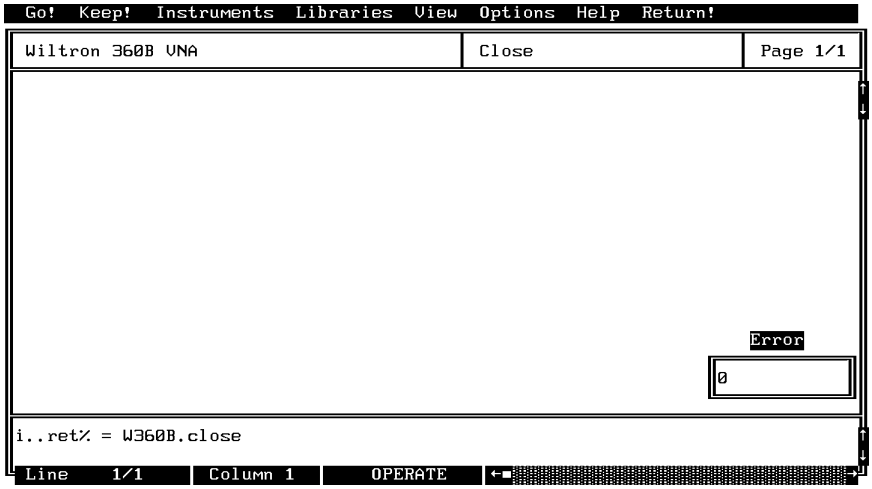
☐ Select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

☐ Select **Instruments,** in the top menu bar, then **360B VNA** to return to the main driver panel.

☐ Move cursor to **Close** (below), and choose **Select** to display the Close panel (below).

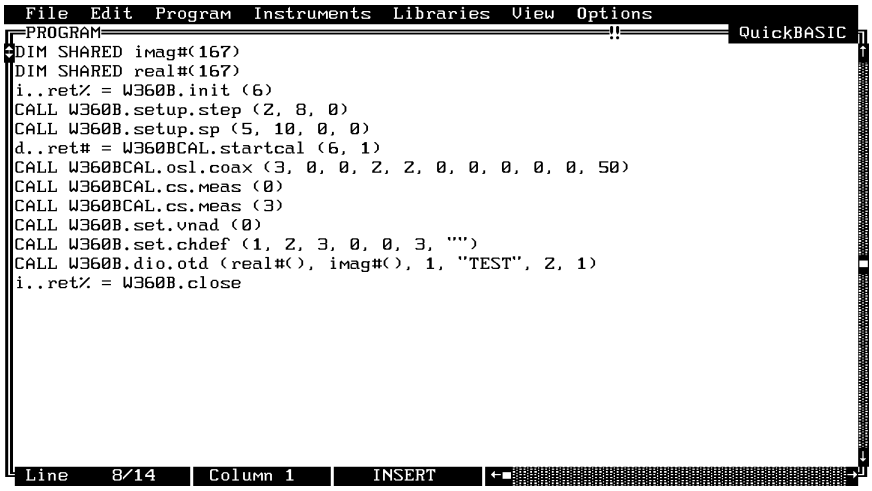


☐ There is nothing you need to do with this panel, except to select **Keep!,** in the top menu bar; then choose **Keep** again to add the code to the program window.

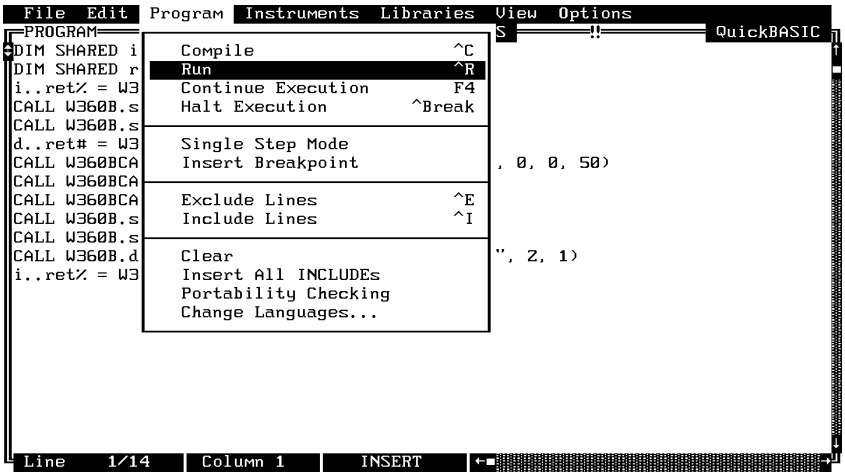


☐ Select **Return!,** on the menu panel, to return to the PROGRAM area.

☐ The program that you have developed now appears (below).



☐ To test the program, move the cursor to **Program,** in the top menu bar, and select **Run** (below) from the pull-down menu.



☐ If there are no program errors, you will see the 360B VNA respond to the program code.

☐ After you are satisfied that the program runs correctly, you can use the **Create EXE** option, on the File menu, to create a stand-alone DOS executable (*.EXE) file. Alternatively, you can use the **Create RTM** option, on the file menu, to create a run-time version (*.RTM) file. That operation is described in the next heading.

☐ To continue with this tutorial, save this program as \LW\PROGRAMS\W360SAMP.BAS.

Creating a Compiled Program

Most programs developed with LabWindows can be compiled with the Microsoft C or BASIC compiler. Some program modules, however, exceed the 64 KB BASIC memory limit and must be run within LabWindows or the LabWindows Run-Time System. The LabWindows Run-Time System includes a DOS extender so programs can access up to 16 MB of memory during execution. Programs executed in the run-time system can make calls to any of the LabWindows libraries and instrument drivers. Programs distributed with the run-time system are in a binary format, so the programs cannot be edited. A stand-alone application (*.EXE or *.RTM) that incorporates the 360B Driver may be created using the Microsoft C or BASIC compilers or LabWindows Run-Time System.

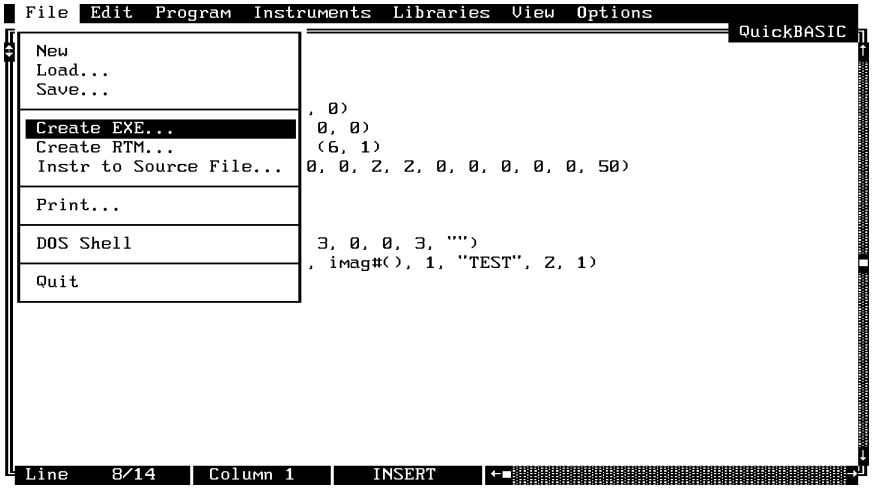
To avoid OUT OF MEMORY errors when using the Microsoft BASIC compiler, you must first optimize the 360B Drivers (W360B.BAS and W360BCAL.BAS) memory usage with the LabWindows FUNNEL.EXE utility (See *LabWindows User's Manual* for instructions).

The LWMAKE option on the file menu can be used to create an executable file in either BASIC or C. The following provides a step-by-step tutorial for creating a *.EXE file using the BASIC 7.1 compiler. This tutorial assumes that you have read and are familiar with the LWMAKE utility description in the *Lab Windows User's Manual* and with the Microsoft BASIC compiler and linker. (It also assumes that you have already run the FUNNEL.EXE used to optimize the W360B.BAS and W360BCAL.BAS files.)

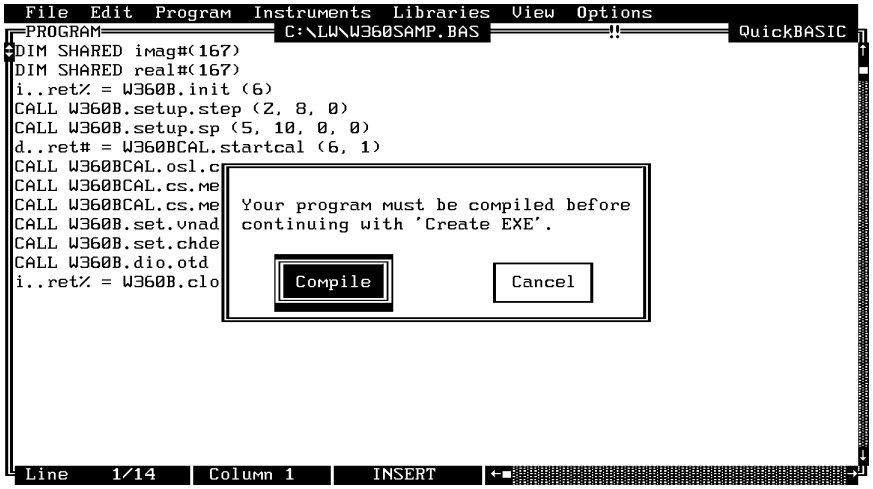
We will start with the program that you completed in the preceeding tutorial. If you did not complete the tutorial, you can create the program listing shown on the preceeding page, and save it as *d*\LW\PROGRAMS\W360SAMP.BAS.

- ☐ Move the cursor to **Instruments,** in the top menu bar, and ensure that the **ANRITSU 360B VNA** and **W360B VNA Calibration** drivers are loaded. If they are not loaded, refer to pages 2-4 and 2-5 for instructions.

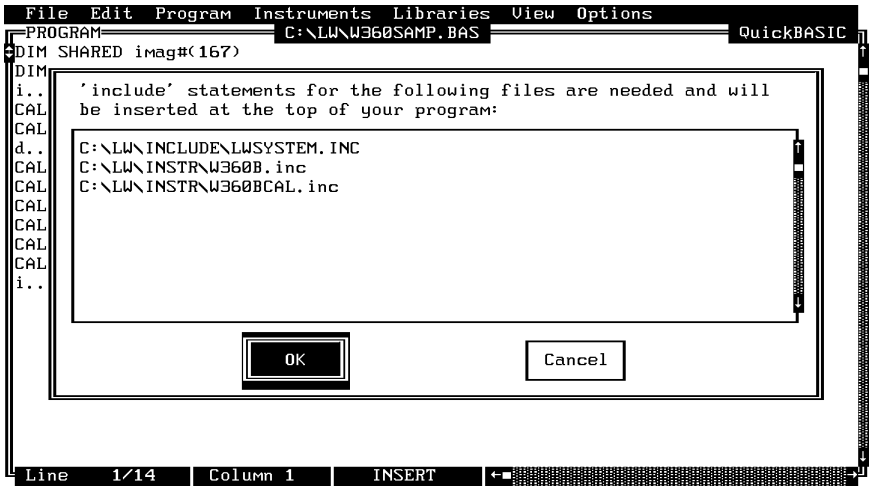
- ☐ Move the cursor to **File,** in the top menu bar, and select **Create EXE** from the pull-down menu (below).



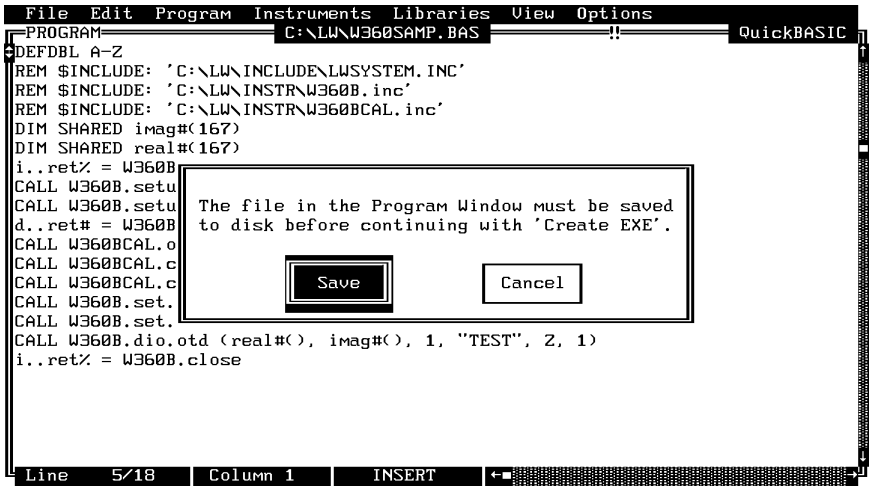
☐ Choose **Compile,** when the next prompt appears. This will insure that the program does not contain any errors. *(NOTE: This menu may not appear, depending upon previous menu selections.)*



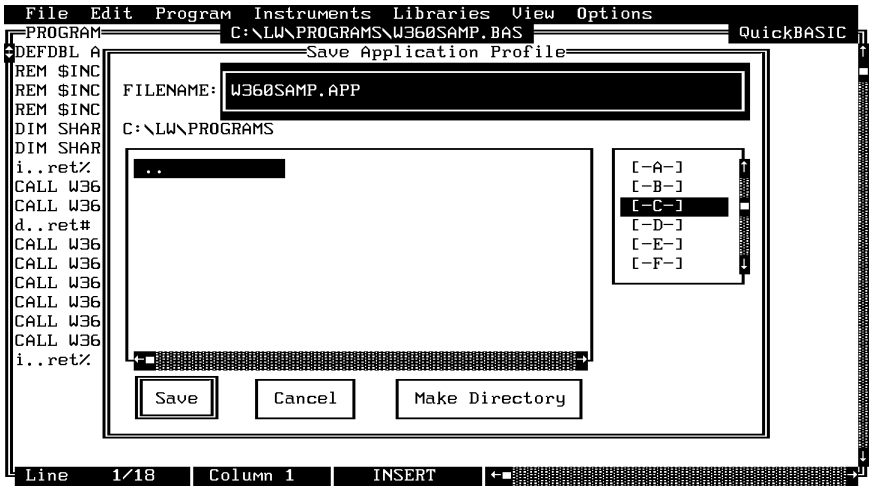
☐ Answer **OK** to the next prompt. This will place include calls to the two required files shown in the file list. These files contain code needed to run your application.



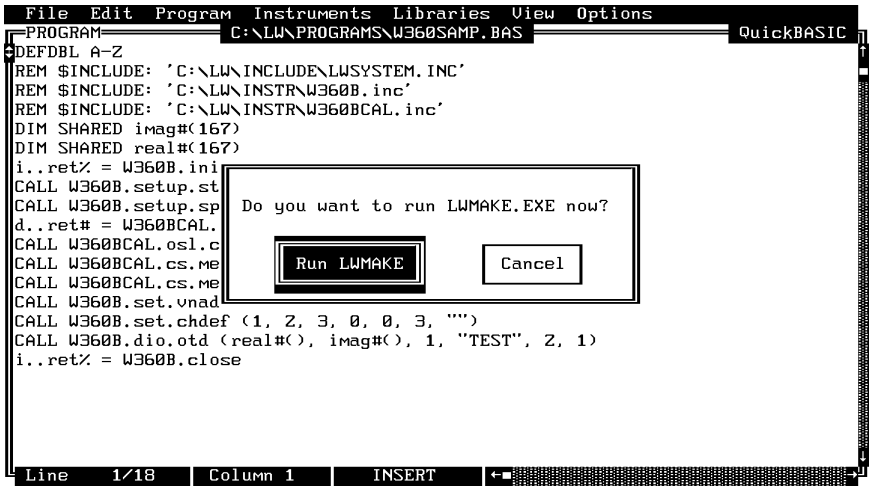
☐ Choose **Save** for the next prompt, below.



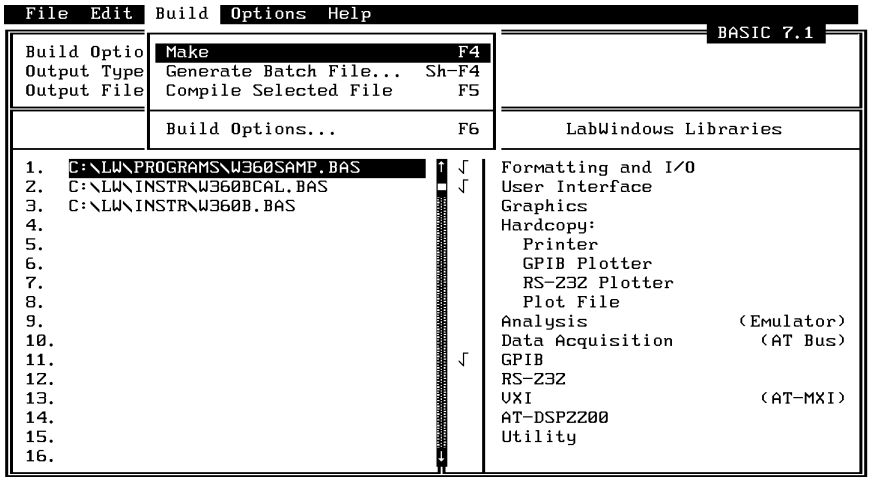
☐ Choose **Save,** again, to save the changes to the file.



☐ Choose **Run LWMAKE,** in the next prompt.



☐ Move cursor to **Build** and choose **Make** from the pull-down menu.



☐ At the conclusion of the Make process, the DOS executable file W360SAMP.EXE will appear in the subdirectory containing the like-named BASIC file. Press <ENTER> to return to the LWMAKE screen. To return to the LabWindows PROGRAM window, select **QUIT-Return to LabWindows** from the **File** menu.

☐ To check your handiwork, choose **DOS SHELL** or **QUIT** from the **File** menu. At the ensuing DOS prompt, type `W360SAMP` to run the program.

360B Instrument Driver Overview

This following pages provide an overview description of the 360B Instrument Driver that includes listings and descriptions for the instrument panels.

General

For the 360B driver function panels, the following can be used as rules of thumb:

- ☐ Frequency values are in gigahertz (GHz) units.
- ☐ Time parameters are in nanoseconds (ns).
- ☐ Distance and offset-length parameters are in millimeters (mm).
- ☐ All hard-copy outputs will commence on execution of panel (GO!) or line of code.
- ☐ A full reset is recommended at the start of any program to insure proper communication with the 360B system. A fast reset can be used for all subsequent operations if necessary.
- ☐ The debug capabilities included with the driver should be used for program development only. This added functionality should be disabled when compiling stand-alone applications using this driver set. The debug variable can be manually set using the view variable function available in LabWindows.

Test Signal Setup

The sweep type defined in the Test Signal Setup class (Table 2-1) will be used for any subsequent calibration operations. If no sweep has been defined, the calibration routines will use the default (Normal 501 points) sweep type.

Table 2-1. *Test Signal Setup Functions*

Sub-Class	Function Name	Function Syntax	Page
Sweep Type	CW Sweep	setup.cw	3-96
	N-Discrete Sweep	setup.ndis	3-100
	Step Sweep	setup.step	3-104
	Time Domain Sweep	setup.tds	3-106
None	Video IF Bandwidth	set.vbw	3-90
	Averaging Factor	set.av	3-68
	Power Levels	setup.sp	3-102
	Trigger Selections	setup.trig	3-108
	Hold Functions	setup.hf	3-98

Other routines, such as Video IF Bandwidth, Averaging Factor, Power Levels, and Trigger/Hold Functions let you fully specify the test signal stimulus and measurement conditions.

Calibration Class

NOTE

The Calibration Class functions are contained in the driver labeled 360BCAL.FP

The calibration functions allow for quick and easy operation of the calibration capabilities existing in the 360B. However, a knowledge of the manually performed calibration sequence is necessary.

The calibration classes (Table 2-2) are sub-classified by line type: Coaxial, Microstrip, and Waveguide. These sub-classes are broken into functions based on calibration method (OSL, Offset-Short, LRL/LRM).

All sub-classes have User Defined parameters that let you modify the normal standards definitions. Operation of the User Defined functions do not generate any GPIB commands unless they are called from the appropriate calibration functions. To select a user defined parameter during a calibration procedure, you must choose user defined in the appropriate calibration sub-class, and the user defined function must have already been executed. In other words, the user defined function (`udef.xxx`) must be called prior to the corresponding calibration setup function. This will ensure that all User Defined variables are saved as static variables and are sent to the 360B during the appropriate calibration setup function call. To use the user defined capabilities follow these steps:

1. Select User Defined Parameters from the appropriate line type sub-class.

2. Exercise the subroutine by selecting GO! (immediate) or KEEP! (to save the line of code to the PROGRAM window). If placed in the PROGRAM window, the `udef.xxxx` routine must occur before the corresponding calibration setup routine (osl, os, lrl). No commands will be sent to the 360B.

3. Select the calibration method you wish to use. Must be in the same Line Type.

4. Select User Defined parameters in this sub-class.

5. Exercise the subroutine (GO!) (or select KEEP! to save the line of code to the PROGRAM window). When executed, the User Defined parameters will be sent to the 360B.

NOTE

Only one User Defined function is available at any one time. You can not define User Defined operations for other than the current line type.

Once the calibration setup is complete, the Measure Cal Standards (cs.meas) panel may be used to automate the calibration standard measurement process. You should first select “Begin Cal” followed by GO! or KEEP!. This will move the 360B from the calibration setup to the calibration measurement mode. From this point, you can invoke the Meas Port 1, Meas Port 2, Meas Both selections, as appropriate. It is important that you know which standards you are measuring at each step; this will determine which port(s) is selected for measurement. For more details, refer to Section 3 and the `cs.meas` panel. Figure 2-1 (page 2-27) shows a calibration example of a Coaxial OSL, 12-Term calibration process.

Table 2-2. *Calibration Class Functions*

Sub-Class	Function Name	Function Syntax	Page
None	Start Calibration	startcal	3-110
None	Flat Power Calibration	cal.pwr	3-10
	Load Cal Kit Coeff	cal.load	3-8
Coaxial Cal	Offset-Short	os.coax	3-46
	Open- Short-Load	osl.coax	3-56
	LRL/LRM (coax)	lrl.line	3-34
	User-Defined Coax	udef.coax	3-114
Microstrip Cal	Offset-Short	os.micro	3-50
	Open- Short- Load	osl.micro	3-60
	LRL/LRM (microstrip)	lrl.line	3-38
	User-Defined Microstrip	udef.micro	3-116
Waveguide Cal	Offset-Short	os.wg	3-54
	LRL/LRM (waveguide)	lrl.line	3-42
	User-Defined Waveguid	udef.wg	3-118
None	Measure Cal Standards	cs.meas	3-14

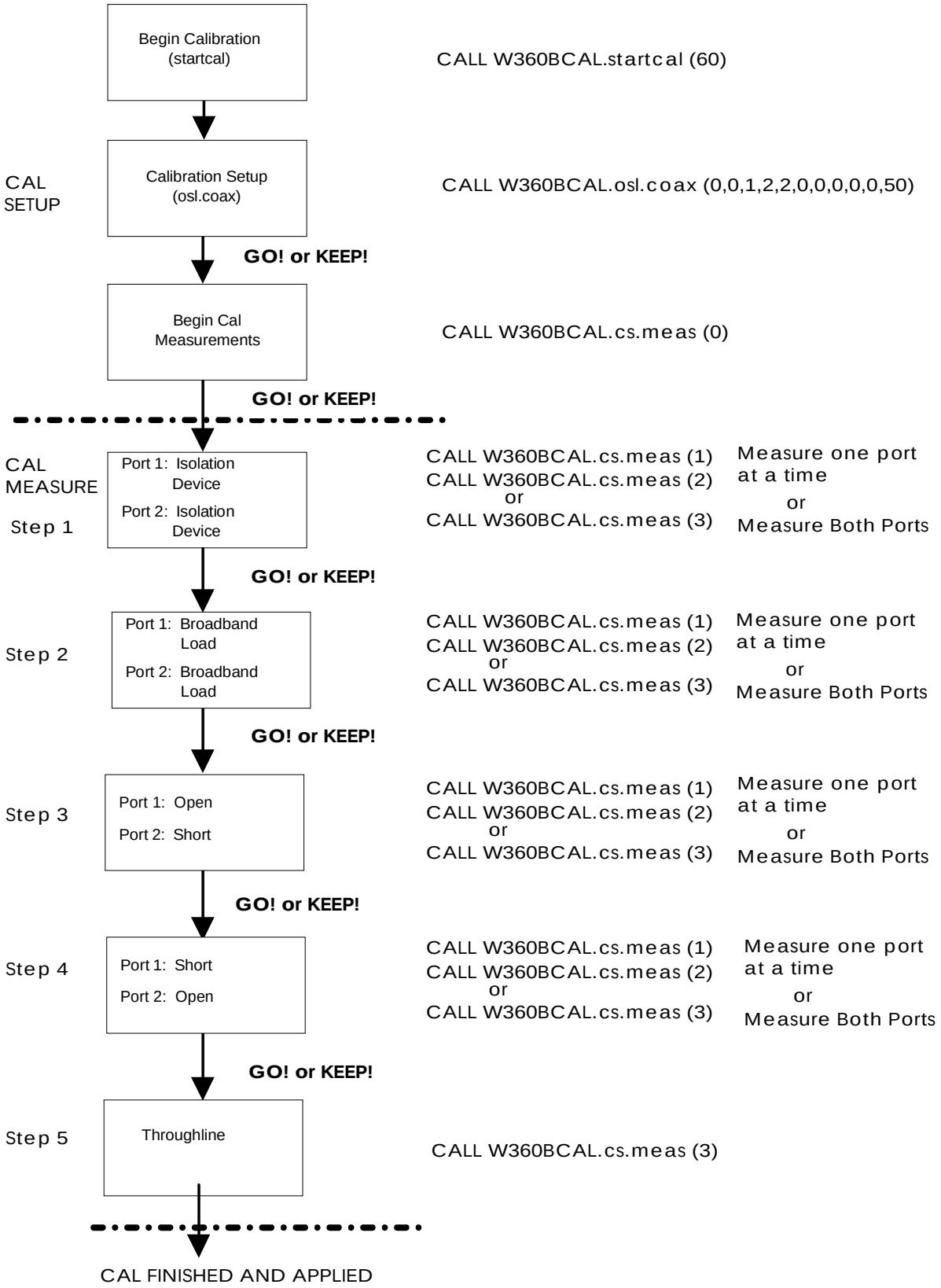


Figure 2-1. Calibration Process for Coax OSL, 12-Term Calibration Procedure

Display Setup Class

This functional class sets up the 360B display format. The type of display is selected with the Channel Display Mode function. This function defines a single or multiple channel display.

The Channel Definition function selects the channel, the S-Parameter, and the graph type to be displayed. You can define a unique measurement ratio by selecting User Defined S-parameter. You can also give this parameter a unique name, which is also entered in this function panel. The User Defined parameter label is limited to five characters, maximum.

The next two functions, Cartesian Scale and Polar Scale, are used to scale the measured data trace. The driver includes no provisions to ensure that you have made the correct function choice. These two functions let you both select a channel and either autoscale or manually scale the display. Note, however, that autoscale must be positioned to 'OFF' to manually scale the data traces.

In the case of the Cartesian Scale function, you can input a group delay aperture. If a Polar or Smith Chart display is selected, you can enter scale factors from those listed in the Polar/Smith Scale panel.

The Smoothing function lets you apply smoothing to the current channel's trace. Note that smoothing is only allowed on certain formats and S-Parameters. Refer to the Model 360B Vector Network Analyzer Operation Manual for a description of S-Parameters and vector network analyzer basics.

Table 2-3. *Display Setup Class Functions*

Sub-Class	Function Name	Function Syntax	Page
None	Channel Display Mode	set.vnad	3-92
	Channel Definition	set.chdef	3-70
	Cartesian Scale	set.scc	3-76
	Polar/Smith Scale	set.scp	3-78
	Smoothing	set.smooth	3-80

Data Analysis Class

MARKER FUNCTIONS:

This functional class lets you set and read values for selected markers. You must specify the channel and the marker to be used (1-6). In all cases, except the set markers function, the results of the marker setting are returned to the current panel. The returns are for both of the complex data values, regardless of current channel format. All values are returned in an ASCII format.

The Set Marker function lets you turn any or all of the markers on or off. If you set a marker on, a frequency should also be entered. If no frequency is entered, the selected marker will still become active and go to a default frequency value. The markers are set for all of the channels currently being displayed.

The Read Marker function reads (gets) the values of all markers. You select the channel from which to retrieve the marker information. All marker values are returned. A zero value is returned for any inactive markers.

The Search Min/Max function lets you perform a marker search routine for either the maximum or minimum trace values. You select the channel, the marker, and the search function (Max or Min). The function returns the marker frequency/time and the real and imaginary values.

TRACE DATA FUNCTIONS:

These functions let you save trace data to the 360B internal channel-based memory registers. Trace manipulation is also available using the standard math function +, –, /, and *.

The Data To Mem selection on the Math Function panel lets you save trace data to the 360B RAM for the selected channel. The Math Function panel also lets you perform selected math functions for trace manipulation. This function also lets you specify the display for the current channel. Note: There must be a saved trace in the selected channel for the math functions to work properly.

LIMIT FUNCTIONS:

The Limits function lets you set limit lines for the 360B display. You must know the current display format in order to set the appropriate limit values.

The Set Limits function lets you turn limit lines on or off. You must select the channel where the limits are to be displayed, then enter an upper and a lower limit. The entered limit values will be displayed. In the case of a complex display, limits can be entered for the imaginary data as well. You must select phase or imaginary units, depending on the current display format.

TIME DOMAIN FUNCTIONS:

These functions let you view responses in the time domain. The time domain option must be installed as part of the 360B operating system. The time domain functions let you perform digital processing operations and set start/stop times and time domain gates. The Domain Selection function lets you select the channel for which the time domain transform is to be performed. You can then select time or distance to be the vertical scale, and a bandpass, impulse, or step response.

The window function is also selected in this function panel. If a step or impulse response is chosen, you must enter the DC term for the transform. Refer to the Model 360B Operation Manual for a thorough discussion of the time domain function.

The Start/Stop Time function lets you set the start and stop time or distance. These parameters are applied to the active channel.

The Set Gate function controls the setting of the time domain gate feature. You select whether the gate should be turned on or off, and whether the gate symbols should be displayed. You can select the format for the entered gate values: Start/Stop or Center/Span. The gate is applied to the active channel.

Table 2-4. *Marker Functions*

Sub-Class	Function Name	Function Syntax	Page
Marker Functions	Read Markers	get.mark	3-24
	Search Min/Max	set.srch	3-82
	Set Markers	set.mark	3-74
Trace Data Functions	Math Functions	tdf.math	3-112
Limit Functions	Set Limits	da.lim	3-16
Time Domain Functions	Domain Selection	set.td	3-84
	Set Gate	set.tdg	3-86
	Start/Stop Time	set.tdt	3-88

Data I/O Class

This functional class lets you perform data input/output functions. Input is defined as loading information into the 360B or computer. Output is defined as taking data out of the 360B.

TRACE FUNCTIONS:

These functions control the storage and retrieval of trace data to user-defined data arrays (and optionally as data files to the current DOS directory). Typical DOS limits apply for filenames. The Input Trace Data function lets you select a trace to be recalled by filename from the current DOS directory. The program transfers the contents of this ASCII data file into three user-defined data arrays for frequency, real, and imaginary trace values.

The Output Trace Data function lets you store trace data to data arrays and, if needed, to the current DOS directory. The data values are saved in the user-entered filename with a *.WTR extension. You should not enter the extensions as part of the filename. The files are saved as space-delimited ASCII data files. See Figure 2-2 for the file format.

FREQ#(0)<tab>REAL#(0)<tab>IMAG#(0)<CR-LF>
FREQ#(1)<tab>REAL#(1)<tab>IMAG#(1)<CR-LF>
•
•
•
FREQ#(n–1)<tab>REAL#(n–1)<tab>IMAG#(n–1)<CR-LF>

Where n = number of measured data points

---

*Figure 2-2. Format for *.WTR Files*

The Output Frequency Data function lets you read the current list of sweep frequencies from the 360B into a pre-defined array. This function is separated from the Output Trace Data function because frequency data is generally only read once, while trace data may be read multiple times during measurements. This provides for less overhead and faster data transfers.

DISK FUNCTIONS:

These functions let you perform various tasks with the 360B internal disk drive — Save, Recall and other utilities can be found under this heading. The Save Function lets you save various information to the 360B internal floppy disk. You select the information to be saved. You can also select setup/calibration, tabular data, or trace memory. Note: When saving traces, the trace must have a memory trace for the active channel. Channel selection is not a user selectable choice.

The Recall Function lets you recall the same information that was stored using the Save Functions panel. The Disk Utilities function lets you purge data files located on the 360B internal floppy disk. It also lets you initialize a floppy disk located in the internal drive for future data storage.

HARDCOPY:

These functions control the data, and to some extent, the format of the data that will be sent to the hardcopy device (plotter or a printer). These peripherals must be connected to the 360B system bus plotter or printer rear panel connectors.

The Header Labels function lets you input informative labels for hardcopy output operations. All labels must be entered as strings. Refer to the Model 360B Operation Manual for more information. The Print! function initiates a print as soon as you select GO! or execute the generated line of code. The printer must be setup and connected to the 360B. you can select the type and format of the data to be dumped to the system printer. The Plot! function initiates a plot as soon as you select GO! or execute the generated line of code. The plotter must be setup and connected to the 360B. You can define the size and type of plot.

Data Analysis Class - Trace Functions

Table 2-5. *Data I/O Functions*

Sub-Class	Function Name	Function Syntax	Page
Trace Functions	Input Trace Data	dio.itd	3-18
	Output Trace Data	dio.otd	3-22
	Output Frequency Data	dio.ofd	3-20
Disk Functions	Save Functions	save.d	3-66
	Recall Functions	recall.d	3-64
	Disk Utilities	ut.disc	3-118
Hardcopy Functions	Headers Labels	hc.ui	3-30
	Print!	hc.prnt	3-28
	Plot!	hc.plt	3-26

System Utilities Class

This functional class lets you control a variety of functions. You can select various video configurations and information to be displayed on the 360B, you can blank frequency information from the display, and you can turn the display off.

The Video Configuration function lets you select the source and target for the 360B trace display. You can select either an internal or external display, and you can select what data is to be displayed on either the external display or 360B display.

The Blank Frequency function lets you blank the frequency information or the entire display.

For all of these functions, refer to the 360B Operation Manual for further information.

Table 2-6. *System Utilities Functions*

Sub-Class	Function Name	Function Syntax	Page
None	Video Configurations	ut.video	3-122
	Blank Frequencies	su.blank	3-94

Communication Functions

This functional class provides for opening and closing GPIB communications between the computer and the 360B. The initialize function opens communications and returns 360B system configuration information, such as minimum/maximum frequency, power levels, and software revision. This function also lets you assign a GPIB address and set the Debug Flag switch.

The Close function terminates the GPIB communication with the 360B.

Table 2-7. *Communications Functions*

Sub-Class	Function Name	Function Syntax	Page
Initialize	Initialize	init	3-32
Close	Close	close	3-12

Section 3
Driver References

Section 3
Driver References

Introduction

This section lists all the 360B Instrument Driver function panel routines in alphabetical order.

Function Panel Descriptions

The 360B LabWindows Driver contains 49 panels that provide an intuitive method for coding instrument functions. Figure 3-1 shows the hierachial structure of the functional panels. Table 3-1 lists these panels and shows the page number on which they are described.

Global and Local Variables

Table 3-2 provides a listing of the global and local variables used by the 360B driver.

Table 3-1. Model 360B Driver Functional Panels

Panel Name	Page No.	Panel Name	Page No.
Averaging Factor	3-68	Open-Short-Load (Microstrip)	3-60
Blank Frequencies	3-94	Output Frequency Data	3-20
CW Sweep	3-96	Output Trace Data	3-22
Cartesian Scale	3-76	Plot!	3-26
Channel Display Mode	3-92	Polar/Smith Scale	3-78
Channel Definition	3-70	Power Levels	3-102
Close	3-12	Print!	3-28
Disk Utilities	3-120	Read Markers	3-24
Domain Selection	3-84	Recall Functions	3-64
Flat Power Calibration	3-10	Save Functions	3-66
Header Labels	3-30	Search Min/Max	3-82
Hold Functions	3-98	Set Markers	3-74
Initialize	3-32	Set Gate	3-86
Input Trace Data	3-18	Set Limits	3-16
Load Cal Kit Coeff	3-8	Smoothing	3-80
LRL/LRM (Coax)	3-34	Start/Stop Time	3-88
LRL/LRM (Microstrip)	3-38	Start Calibration	3-110
LRL/LRM (Waveguide)	3-42	Step Sweep	3-104
Measure Cal Standards	3-14	Time Domain Sweep	3-106
Math Functions	3-112	Trigger Selections	3-108
N-Discrete Sweep	3-100	User Defined Coax	3-114
Offset-Short (Coax)	3-46	User Defined Microstrip	3-116
Offset-Short (Microstrip)	3-50	User Defined Waveguide	3-118
Offset-Short (Waveguide)	3-54	Video I.F. Bandwidth	3-90
Open-Short-Load (Coax)	3-56	Video Configuration	3-122

Table 3-2. Variables Used With 360B Driver

GLOBAL VARIABLES:
FRST% = Flag for fast reset
W360 DEBUG% = Flag for debug mode in 360B VNA module
W360CAL DEBUG% = Flag for debug mode in 360BCAL VNA calibration module
W360B.err% = Error value in 360B VNA module
W360BCAL.err% = Error value in 360BCAL VNA calibration module
LOWF$ and LOWFREQ# = Minimum frequency returned by ID response
HIGH$ and HIGHFREQ# = Maximum frequency returned by ID response
SWRV$ and SWREV# = Software revision returned by ID response
MINP$ and MINPWR# = Minimum power returned by ID response
MAXP$ and MAXPWR# = Maximum power returned by ID response
CWFREQ# = User entered CW frequency
NOTE: *All variables returned to the initialize panel are returned as strings.*

W360B MODULE LEVEL VARIABLES:
bd% = Contains the device descriptor returned by the Open device
cmd$ = Command string sent to the 360B
actch% = Active channel (1 through 4)
gtype% = Flag for active graph type
1 = Log magnitude display
2 = Phase
3 = Smith Chart
4 = SWR
5 = Group delay
6 = Inverted Smith Chart
7 = Polar linear mag
8 = Polar log mag
9 = Linear magnitude
11 = Real
12 = Imaginary
13 = Real and imaginary
14 = Log magnitude and phase
asp% = Active S-Parameter
1 = S_{11}, 2 = S_{21}, 3 = S_{12}, 4 = S_{22}
chd% = Active channel display
amkrx% = Active markers: x = 1 thru 6, 0 = Inactive, 1 = Active
tmp% = Time distance parameter: 1 = Time, 0 = Distance

W360BCAL MODULE LEVEL VARIABLES:
calon% = Calibration on/off
0 = Off, 1 = On. This variable is not used to reflect the state of the 360B; it is used to determine if the last operator step was a calibration function.
calch% = Flag for user defined calibration parameters.
0 = Flag for normal calibration Parameters.
1 = Coaxial user defined connectors
2 = User defined waveguide parameters
3 = User defined microstrip parameters
caltp% = Calibration type
aswtyp% = Active sweep type
1 = Step sweep
2 = CW sweep
3 = N-disc. sweep
5 = Time domain sweep

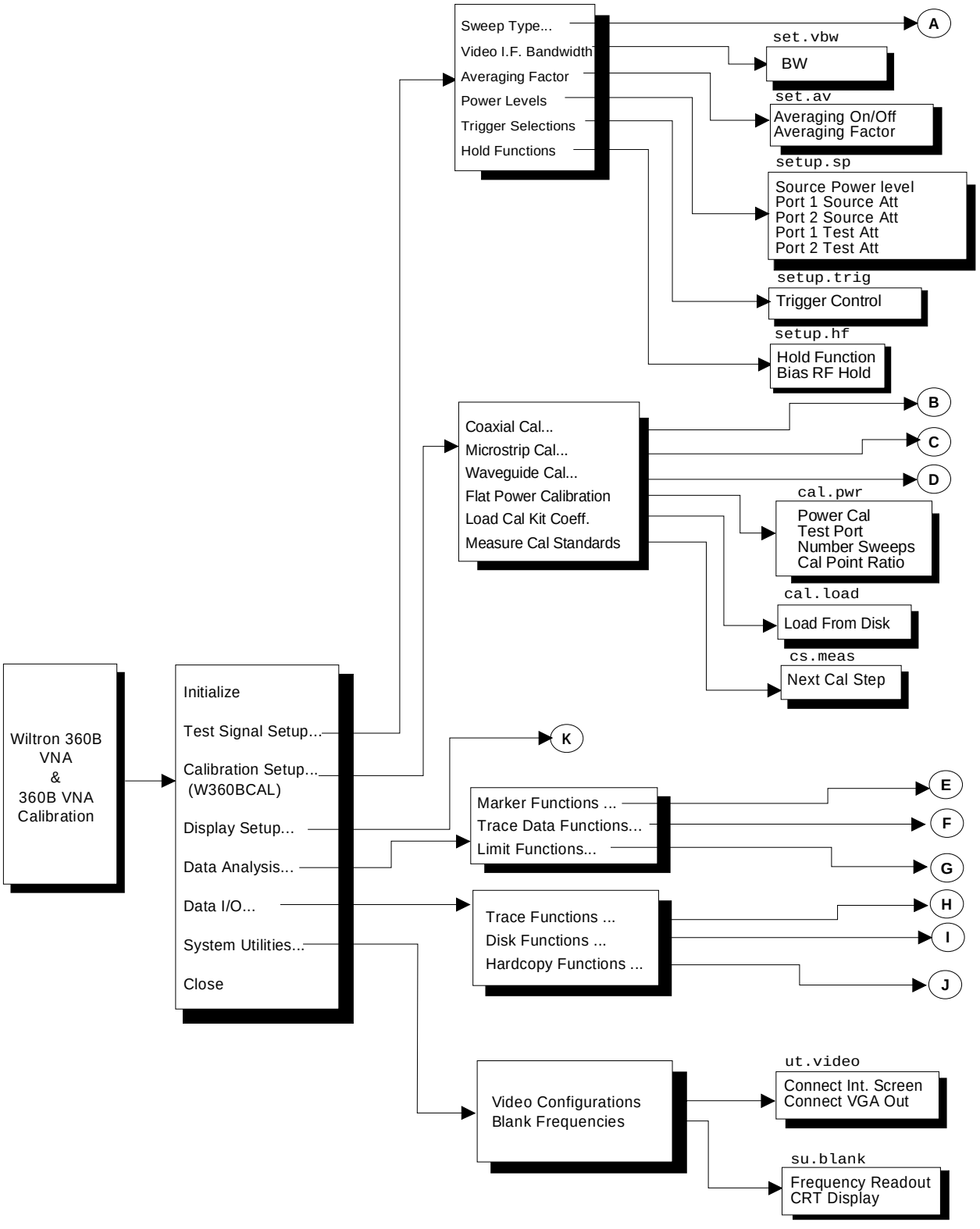


Figure 3-1. Function Panel Tree (1 of 2)

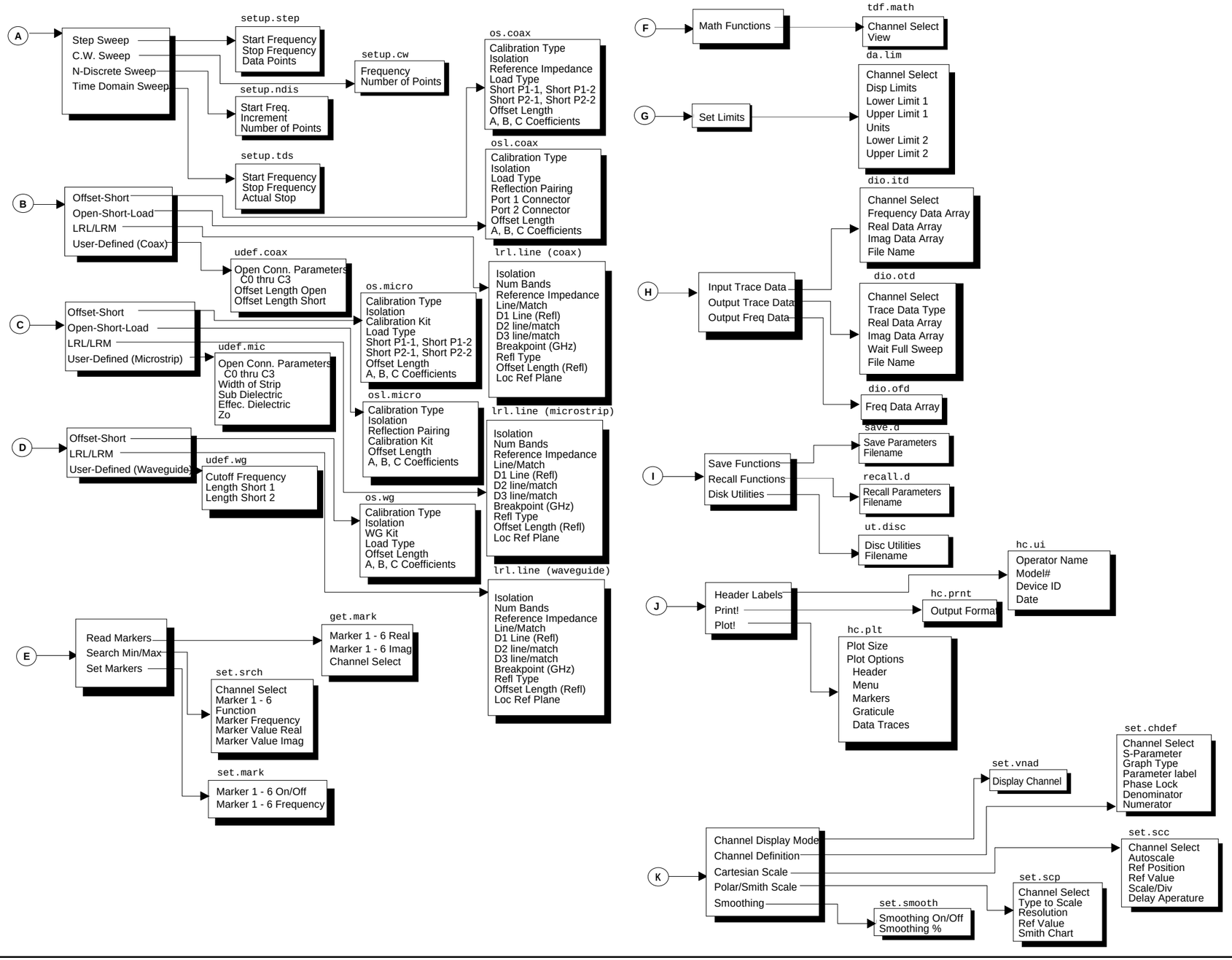
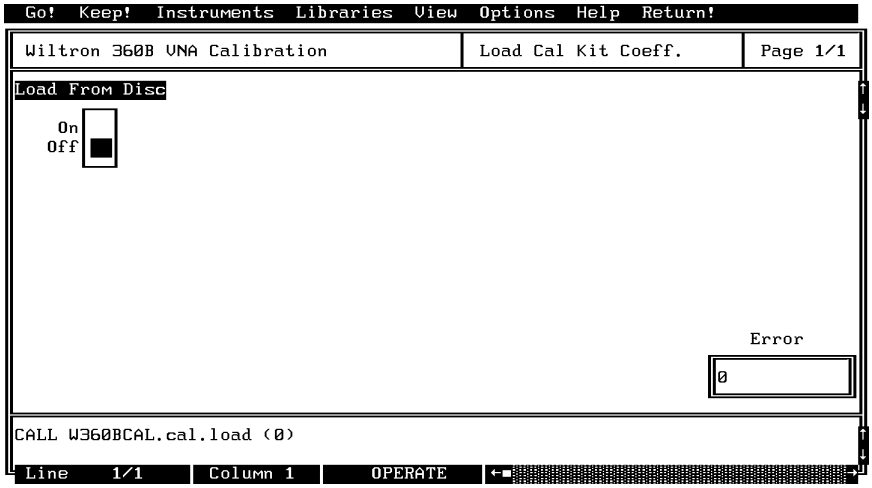


Figure 3-1. Function Panel Tree (2 of 2)

cal.load

Function Panel Name: Load Cal Kit Coeff(icients)

Description: This function loads the coefficient data for the calibration components from a floppy disk.



Controls:

Load From Disk On/Off: Lets users turn the Load From Disk function on or off.

Input Parameters: (D) is default setting.

Variable Name	Variable Type	Description	Details
ST%	Integer	Load calibration data from disk	0 = Off (D) 1 = On

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

Quick BASIC:

```
REM Turns the calibration data "Load From Disk" function on or
off.
CALL W360BCAL.cal.load (ST%)
```

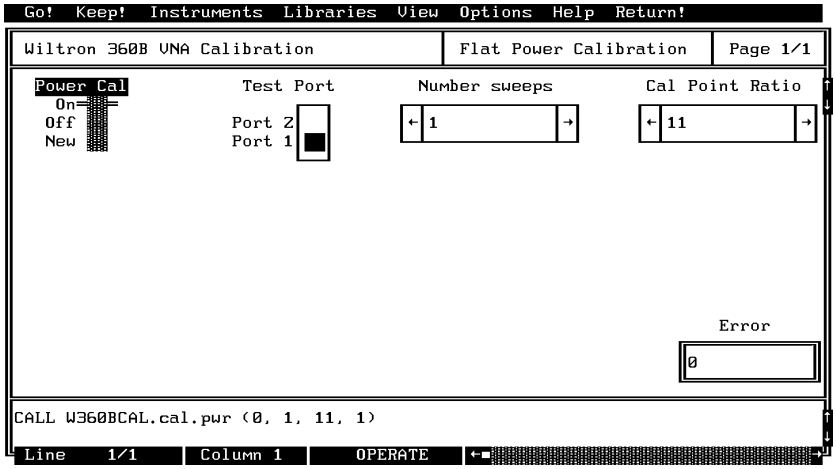
Microsoft C:

```
/* Turns the calibration data "Load From Disk" function on or
off. */
W360BCAL_cal_load (ST)
```

cal.pwr (360B only)

Function Panel Name: Flat Power Calibration

Description: This function lets users setup and perform a flat power calibration.



Controls:

Power Cal:

On: Turns on the existing flat-power correction.

Off: Turns off the existing flat-power correction.

New: Performs a new flat-power calibration.

Test Port Lets users select the test port to which they want the flat power calibration applied (Port 1 or Port 2).

Number of Sweeps: Lets users enter the the number of power sweeps they wish taken, from 1 to 5. Typically, 2 sweeps will provide for better than ±0.5 dB flatness.

Cal Point Ratio: Lets users enter the the number of frequency points at which power data is taken. Test port power can be measured at every frequency point or at equally spaced frequency point intervals, such as one power point every X frequency points (X:1).

Input Parameters: (D) is default setting.

Variable Name	Variable Type	Description	Details	Range
TP%	Integer	Test Port	0 = Port 1 (D) 1 = Port 2	
NUMSW%	Integer	Number of sweeps to average	1 (D)	1 to 5
DPTS%	Integer	Number of skipped data points	11 (D)	11 thru 500, at preset increments
ONF%	Integer	Flat power cal on/off	0 = On (D) 1 = Off 2 = New	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes

Program Examples:

Quick BASIC:

```
REM Assign flat power correction values to test port.
CALL W360BCAL.cal.pwr (TP%,NUMSW%,DPTS%,ONF%)
```

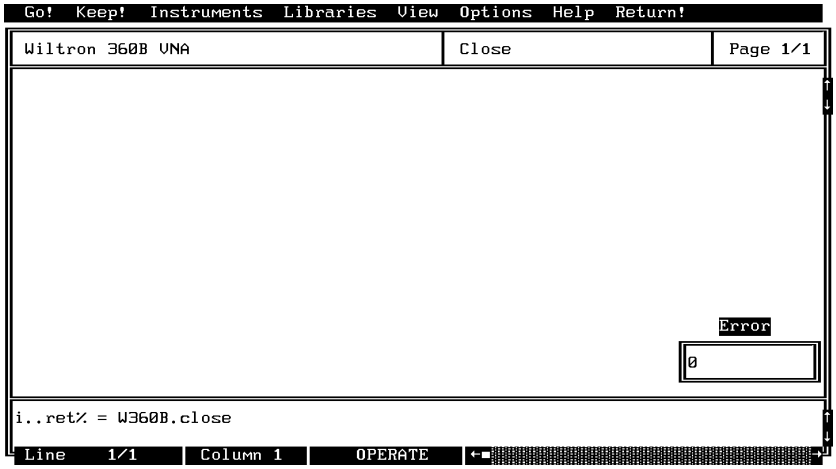
Microsoft C:

```
/* Assign flat power correction values to test port. */
W360BCAL_cal_pwr (TP,NUMSW,DPTS,ONF)
```

close

Function Panel Name: Close

Description: This function closes the GPIB communications with the 360B.



Controls: This panel has no controls.

Input Parameters: None.

Output Parameters: None.

Error:

Program Examples:

Quick BASIC:

```
REM Close the 360B Instrument Driver.
CALL W360B.close()
or
i..ret% = W360BCAL.close()
```

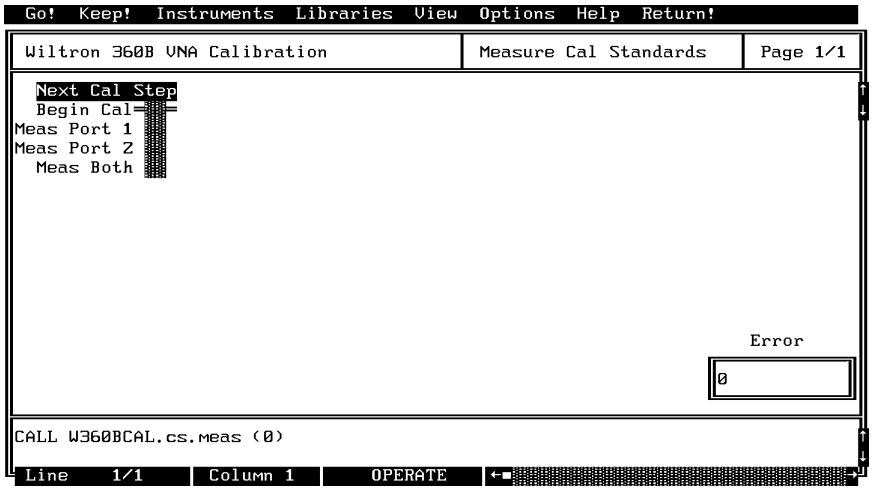
Microsoft C:

```
/* Close the 360B Instrument Driver. */
W360B_close()
or
i_ret = W360BCAL_close()
```

cs.meas

Function Panel Name: Measure Cal(ibration) Standards

Description: This function lets users measure the calibration standard(s) for the specified calibration. This should be completed immediately following the calibration setup function.



Controls:

Next Cal Step:

Begin Cal: Starts the calibration measurement sequence. This is performed after calibration setup.

Meas Port 1: (360B only) Measures the Port 1 device only. Used only for one-port devices, such as Opens and Shorts. This selection is only valid during calibration steps that provide the option: PRESS <1> FOR PORT 1 DEVICE.

Meas Port 2: (360B only) Measures the Port 2 device only. Used only for one-port devices, such as Opens and Shorts. This selection is only valid during calibration steps that provide the option: PRESS <2> FOR PORT 2 DEVICE.

Meas Both: Measures both Port 1 and Port 2 devices without pausing between steps. This should be the default selection at each point in the calibration measurement sequence.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CSTP%	Integer	Calibration step	0 = begin cal sequence(D). No data is taken 1 = Take cal data port 1 2 = Take cal data port 2 3 = Take cal data both ports NOTE: If function doesn't return or VNA does not start measuring device, then the wrong calibration step was choosen. Press Ctrl + Break keys and select the correct call step.

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

Quick BASIC:

```
REM Get the calibration standards.
CALL W360BCAL.cs.meas (CSTP%)
```

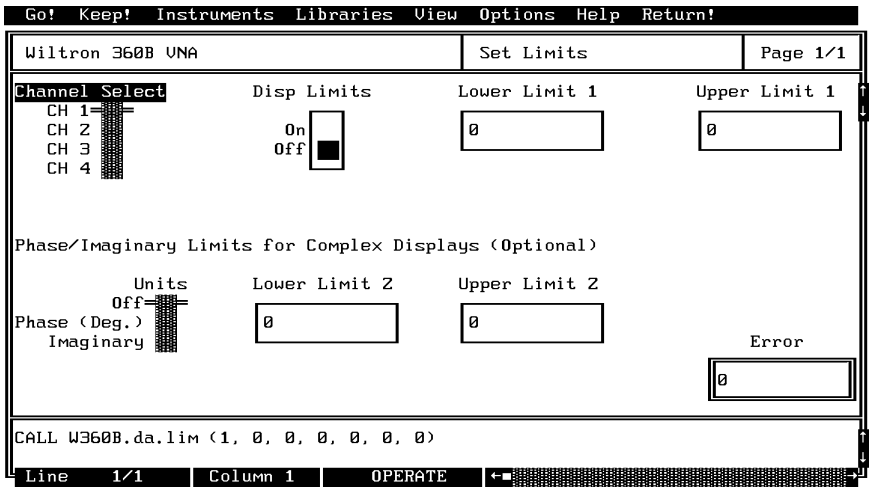
Microsoft C:

```
/* Get the calibration standards. */
W360BCAL_cs_meas (CSTP)
```

da.lim

Function Panel Name: Set Limits

Description: This function lets users set and display limit lines.



Controls:

Channel Select: Lets users select the channel on which the limit lines will be displayed.

Disp Limits: Lets users turn the limit display on or off.

Lower Limit 1: Lets users set a value for the lower limit line.

Upper Limit 1: Lets users set a value for the upper limit line.

Units: Lets users optionally select the type of display units for the phase/imaginary portions of complex displays (such as log magnitude and phase, linear magnitude and phase, etc).

- **Off:** Turns off the units selection.
- **Phase (Deg.):** Select degrees for a display of phase.
- **Imaginary:** Selects imaginary units.

Lower Limit 2: Lets users set a value for the lower limit line.

Upper Limit 2: Lets users set a value for the upper limit line.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
CHSEL%	Integer	Active channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4	
DLM%	Integer	Display limit lines	0 = Off (D) 1 = On	
LL#	Real	Lower limit	0 (D)	
UL#	Real	Upper limit	0 (D)	
LL2#	Real	2nd lower limit	0 (D)	
UL2#	Real	2nd upper limit	0 (D)	
DUALL%	Integer	Dual limit display	0 = Off (D) 1 = Second limit in Degrees 2 = Second limit in imaginary units	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Set display limits.
CALL W360B.da.lim(CHSEL%,DLM%,LL#,UL#,LL2#,UL2#,DUALL%)
```

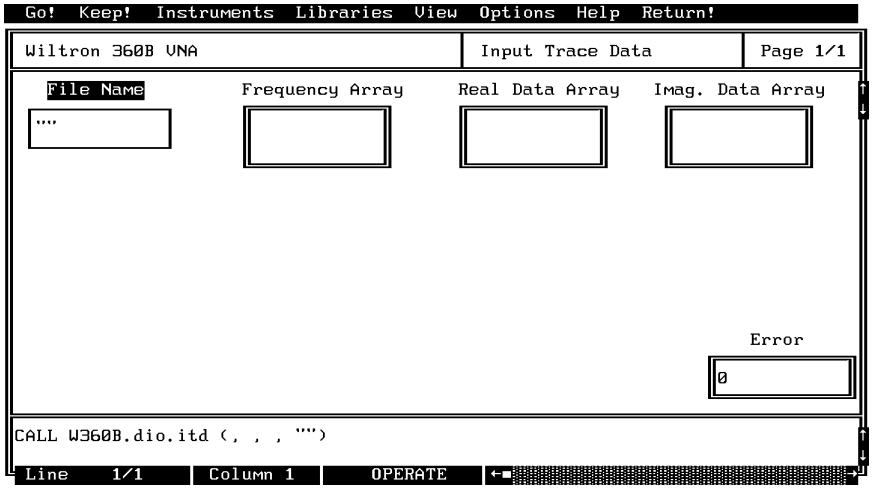
Microsoft C:

```
/* Set display limits. */
W360B_da_lim(CHSEL,DLM,LL,UL,LL2,UL2,DUALL%)
```

dio.itd

Function Panel Name: Input Trace Data

Description: This function lets users input trace data from a pre-stored DOS file (*.WTR) from the external computer in the 360B. The file must be in the current disk directory. The input data will be kept in three user-defined arrays.



Controls:

Freq Data Array: Lets users enter a name for a double array to hold frequency data.

Real Data Array: Lets users enter a name for a double array to hold real data.

Imag Data Array: Lets users enter a name for a double array to hold imaginary data.

NOTE

The Data Arrays may be easily declared using the **Options** top-menu-bar selection followed by the **Declare Variable** selection from the ensuing drop-down menu. The number of elements chosen for each array should be at least as big as the number of 360B data points.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
RDATA#	Real	User-dimensioned data	
IDATA#			
FDATA#			
FAME%	Integer	Filename	Maximum 8 characters

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Input trace data.
CALL W360B.dio.itd(RDATA#(), IDATA#(), FDATA#(), FAME$)
```

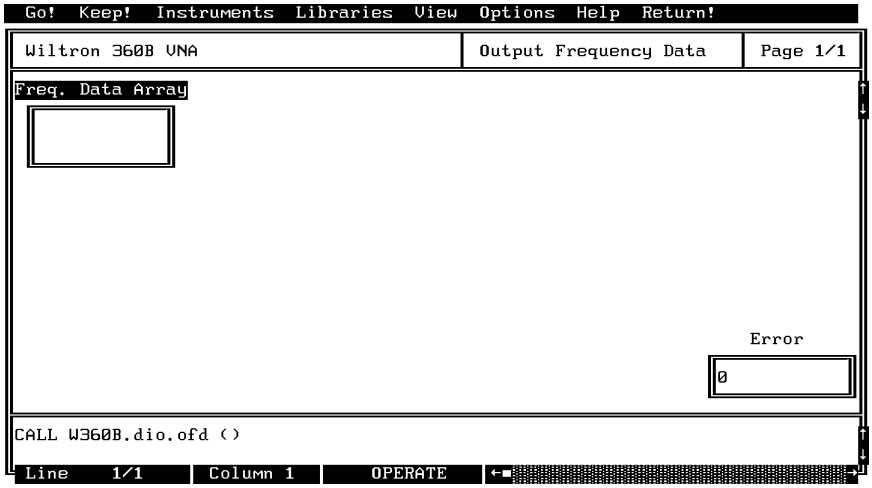
Microsoft C:

```
/* Input trace data. */
W360B_dio_itd(RDATA, IDATA, FDATA, FAME)
```

dio.ofd

Function Panel Name: Output Frequency Data

Description: This function outputs a list of current 360B sweep frequencies. This data is kept in a user-defined array.



Controls:

Freq Data Array: Lets users enter a name for a double array to hold frequency data.

NOTE

The Freq Data Array may be easily declared using the **Options** top-menu-bar selection followed by the **Declare Variable** selection from the ensuing drop-down menu. The number of elements chosen for each array should be at least as big as the number of 360B data points.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
FDATA#	Real	User-dimensioned data array	

Input Parameters: None

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Input trace data.
CALL W360B.dio.ofd(FDATA#())
```

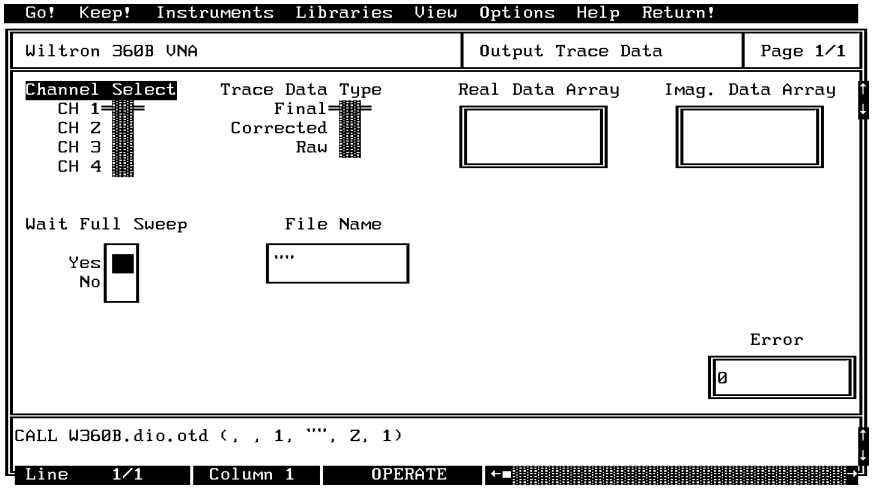
Microsoft C:

```
/* Input trace data. */
W360B_dio_ofd(FDATA())
```

dio.otd

Function Panel Name: Output Trace Data

Description: This function lets users output a data trace from the 360B and place it into two user-defined arrays. The trace data may also be stored to the user-specified file-name (*.WTR) in the external computer's current disk directory.



Controls:

Channel Select: Lets users select the channel from which the trace data will be output.

Data Type:

Corrected: Data will be output in error-corrected real, imaginary format.

Final: Data will be output in error-corrected final display format.

Raw: Data will be output in non-error-corrected real, imaginary format.

Filename: Lets uses enter a file name for their data. If no file-name is entered, data is not saved to disk.

Real Data Array: Lets users select enter a name for an array to hold real data.

Imag Data Array: Lets users select enter a name for an array to hold imaginary data.

Wait Full Sweep: Yes/No If “Yes” is selected, the 360B will take one complete sweep before outputting trace data. This will ensure valid data. However, if the trace data is already valid, this extra sweep can be avoided by selecting "No."

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CHSEL%	Integer	Selects active channel.	1 = CH1 (D) 2 = CH2 3 = CH3 4 = CH4
FAME$	String	Filename	Maximum 8 characters
DTYP%	Integer	Data type: Corrected or final	1 = Corrected (D) 2 = Final 3 = Raw
RDATA#	Real	User-dimensioned data	
IDATA#	Real		
WFS%	Integer	Wait Full Sweep Flag	0 = No 1 = Yes

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Output trace data.
CALL W360B.dio.otd(RDATA#(),IDATA#(),CHSEL%,FAME$,DTYP%,WFS%)
```

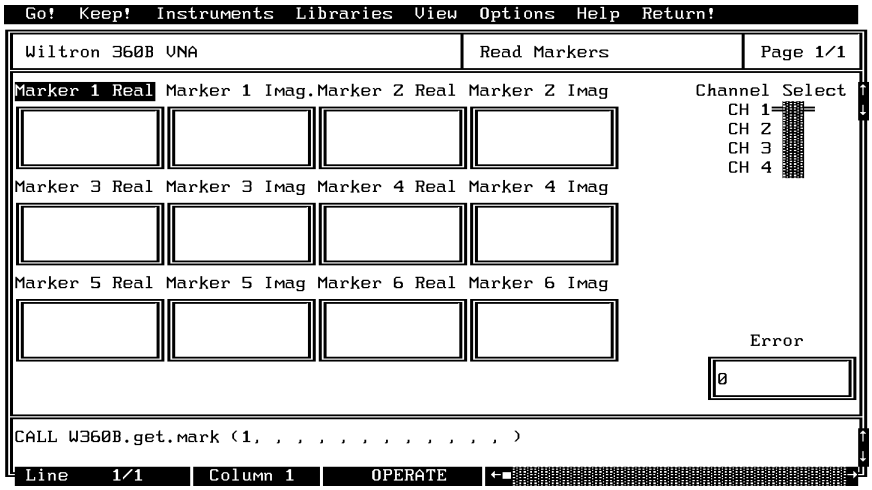
Microsoft C:

```
/* Output trace data. */
W360B_dio_otd(RDATA(),IDATA(),CHSEL,FAME,DTYP,WFS)
```

get.mark

Function Panel Name: Read Markers

Description: This function lets users read the values for all markers set by Set Markers or Search Min/Max functions. All inactive markers return zeros.



Controls:

Marker n Real: Returns the Marker *n* Real value.

Marker n Imag: Returns the Marker *n* Imaginary value.

Channel Select: Lets users select the active channel that contains the desired marker output information.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CHSEL%	Integer	Active channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4
MKV1# thru MKV6#	Real	Returned values for real markers 1 thru 6.	
MKVI1# thru MKVI6#	Real	Returned values for imaginary markers 1 thru 6.	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Get the value of up to six real and imaginary markers.
CALL W360B.get.mark(CHSEL%, MKV1#,MKV2#,MKV3#,MKV4#,MKV5#,
MKV6#,MK1I#,MK2I#,MK3I#,MK4I#,MK5I#,MK6I#)
```

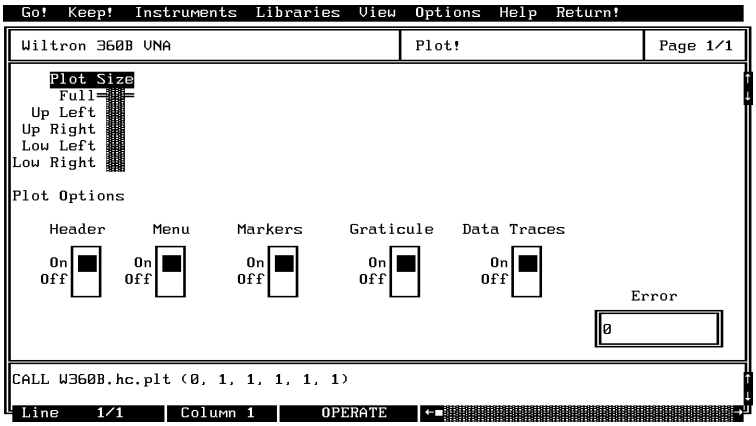
Microsoft C:

```
/* Get the value of up to six real and imaginary markers. */
W360B_get_mark(CHSEL, MKV1,MKV2,MKV3,MKV4,MKV5,MKV6,MK1I,MK2I,
MK3I,MK4I,MK5I,MK6I)
```

hc.plt

Function Panel Name: Plot !

Description: This function lets users select options for plotter hard-copy outputs and sends the current 360B graphical display to the system plotter.



Controls:

Plot Size: Lets users select the plot size and/or position.

Plot Options: Turn plotter options (Header, Menu, Markers, etc.) on or off.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
PLS%	Integer	Plot size	0 = Full (D) 1 = Upper Left 2 = Upper Right 3 = Lower Left 4 = Lower Right	
HDR%	Integer	Header	0 = Off (D) 1 = On	
MENU%	Integer	Menu	0 = Off (D) 1 = On	
MKR%	Integer	Markers	0 = Off (D) 1 = On	
GRAT%	Integer	Graticule	0 = Off (D) 1 = On	
DTR%	Integer	Data trace	0 = Off (D) 1 = On	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Select plotter options.
CALL W360B.hc.plt(PLS%,HDR%,MENU%,MKR%,GRAT%,DTR%)
```

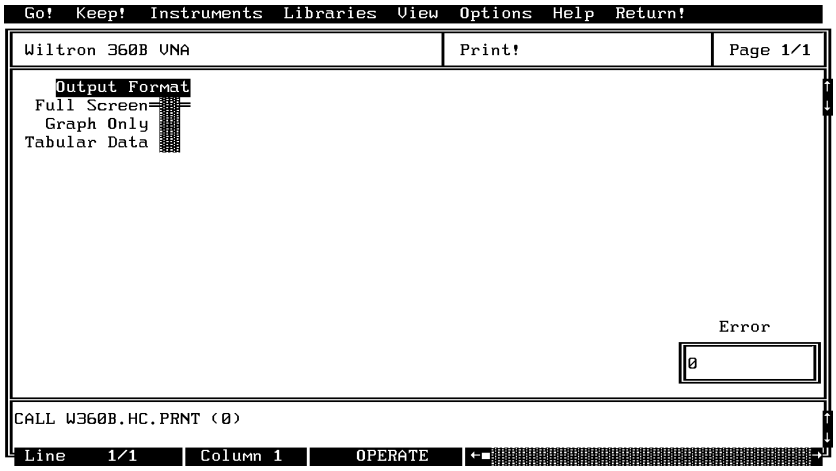
Microsoft C:

```
/* Select plotter options. */
W360B_hc_plt(PLS,HDR,MENU,MKR,GRAT,DTR)
```

hc.prnt

Function Panel Name: Print!

Description: This function lets users select printer ouput format and sends the current 360B graphical display data to the system printer.



Controls:

Output Format: Lets users select a format for printing.

Full Screen: Outputs the full screen-graph, header, and menu.

Graph Only: Outputs only the displayed graph and header.

Tabular Data: Outputs the displayed trace in tabular data format.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
OUTF%	Integer	Output	0 = Full Screen (D) 1 = Graph Only 2 = Tabular Data	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Select printer options.
CALL W360B.hc.prnt(OUTF%)
```

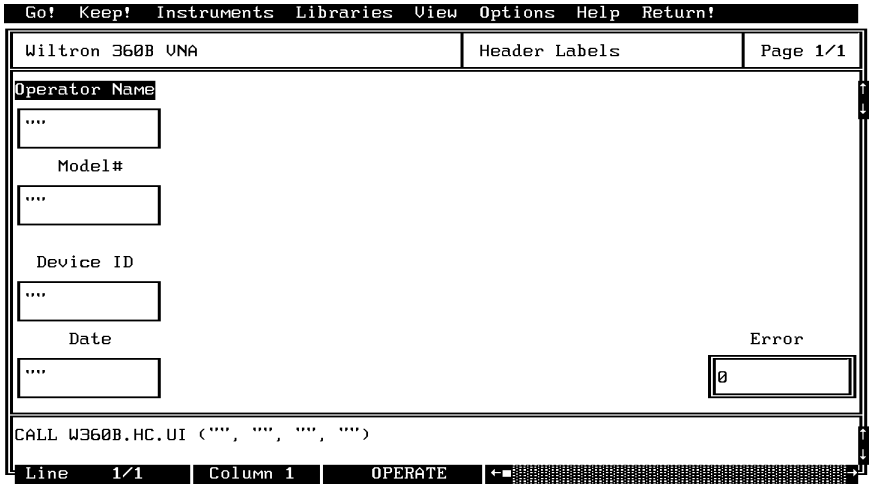
Microsoft C:

```
/* Select printer options. */
W360B_hc_prnt(OUTF)
```

hc.ui

Function Panel Name: Header Labels

Description: This function lets users input header information for all subsequent hardcopy output.



Controls:

Operator Name: Lets users enter the operator's name.

Model #: Lets users enter the model number of the test device.

Device ID: Lets users enter an identification number for the test device.

Date: Lets users enter a date.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
OPNAME$	String	Operator name	12 Characters, maximum
MNUM$	String	Model number	12 Characters, maximum
DID$	String	Device ID	12 Characters, maximum
DT$	String	Date	12 Characters, maximum

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Assign header information.
CALL W360B.hc.ui(OPNAME$,MNUM$,DID$,DT$)
```

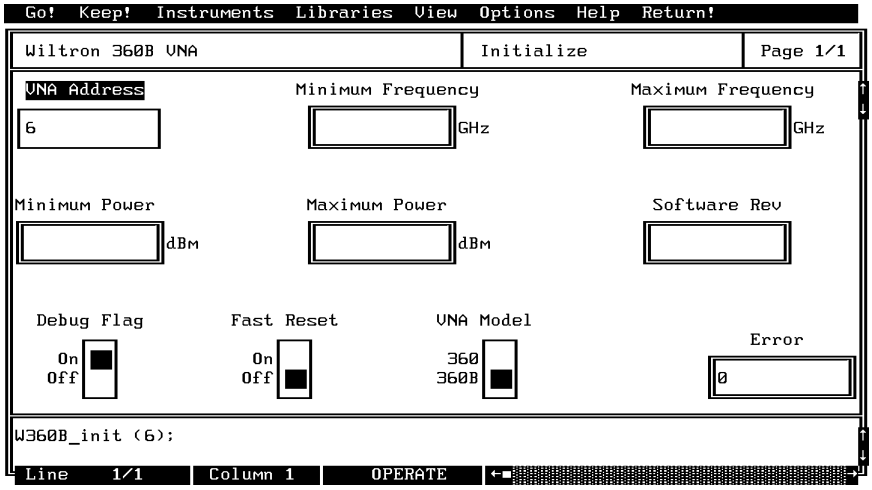
Microsoft C:

```
/* Assign header information. */
W360B_hc_ui(OPNAME,MNUM,DID,DT)
```

init

Function Panel Name: Initialize

Description: This function opens the GPIB communication with the 360B and sets it to its preset state. The device configuration must already be completed. System configuration parameters — such as minimum/maximum frequency, firmware revision, etc., — are returned and displayed.



Controls:

VNA Address: Lets users enter a GPIB address for the 360B. The factory-set default address is 6.

Minimum Frequency: Displays the minimum frequency for a full band sweep.

Maximum Frequency: Displays the maximum frequency for a full band sweep.

Minimum Power: Displays the minimum output power to which the 360B can be set.

Maximum Output Power: Displays the maximum output power to which the 360B can be set.

Firmware Rev: Displays the 360B firmware revision level.

Debug Flag: (Secondary Function) Controls the Debug Function. This function is discussed in Section 2.

Off: Debug Function is off.

On: All appropriate W360B errors will be returned, refer to page 2-8.

Fast Reset: (Secondary Function) Turns the fast reset mode on or off. When enabled, GPIB communication is established, but the 360B is not preset to its default state. In other words, a normal reset is the same as pressing the 360B front panel DEFAULT PROGRAM key. Whereas, a Fast Reset merely places the 360B in the Remote state; it does not reset any of the front panel controls.

VNA Model: (Secondary Function) Lets users select Model 360 or Model 360B, depending on which model they will be using.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
ADD%	Integer	VNA Address.	Returns the following global variables as strings: Minimum Operating Frequency Maximum Operating Frequency Minimum Source Power Maximum Source Power Firmware Revision

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

QuickBASIC:

```
REM Assign GPIB address.
i..ret% = W360B.init (ADD%)
```

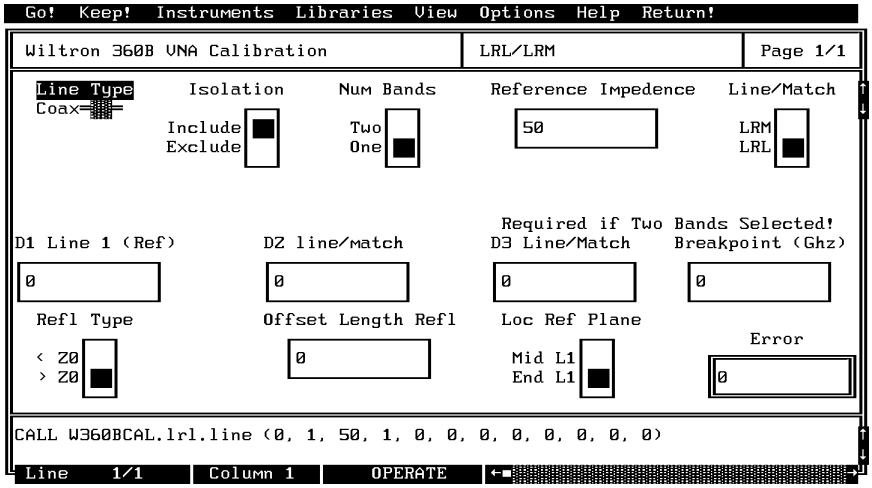
Microsoft C:

```
/* Assign GPIB address. */
i_ret = W360B_init (ADD)
```

lrl.line

Function Panel Name: LRL/LRM Calibration Setup (Coax)

Description: This function lets users define the setup parameters for a coaxial LRL/LRM type of calibration.



Controls:

Isolation Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Num Bands Lets users select between one band for a two-line calibration or two bands for a three-line calibration. The number of included lines determines the frequency range. Two lines limit you to a 9:1 span; whereas, three lines permit a 81:1 span.

Reference Impedance (360B only)	Lets users enter the system reference impedance (Zo).
Line/Match	Lets users select between line-reflect-line (LRL) or line-reflect-match (LRM) calibration.
D1 Line 1 (Refl)	Lets users enter the length of Line 1, for an LRL or LRM calibration.
D2 L ine/Match	Lets users enter the length of Line 2, for an LRL calibration, or is set to zero for a lowband standard for an LRM calibration.
D3 Line/Match	Lets users enter the length of Line 3, for an LRL calibration, or zero for the highband standard for an LRM calibration (used only for two-band calibrations).
Breakpoint (GHz)	Lets users enter the breakpoint frequency. For two-line LRL calibration, the breakpoint frequency should equal the upper frequency of the low-frequency LRL line. For a combined LRL/LRM calibration, breakpoint frequency should equal the top calibration frequency divided by six. Example: For a frequency range of 0.04 to 60 GHz, the breakpoint should equal 10 GHz (60/6). For an LRM calibration, there is no breakpoint frequency.
Refl Type:	Lets users select between an Open (>Zo) and a Short (<Zo) reflection standard.
Offset Length Refl:	Lets users enter an offset-length value (mm) for the reflection standard.
Loc Ref Plane:	Lets users select a location for their calibration reference planes.
Mid L1	Locates the reference plane at the mid-point of Line 1.
End L1	Locates the reference planes at the ends of Line 1.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
LM%	Integer	Line or match	0 = LRL (D) 1 = LRM
LT%	Integer	Line type	0 = Coax (D) (Set by program, cannot be reconfigured by use)
REFZ#	Real	Reference impedance	50 ohms (D)
ISO%	Integer	Isolation	0 = Exclude isolation 1 = Include isolation (D)
LRL REFPL%	Integer	Reference plane location	0 = Ref plane at ends of line 1 (D) 1 = Ref plane at line 1 midpoint
NUMB%	Integer	Number of bands	0 = 2 line: LRL, LRM (D) 1 = 3 line : LRL/LRM, LRL/LRL, LRM/LRM
D1L#	Real	Length of line 1	0 = 0 mm (D)
D2LM#	Real	Length of line 2/match	0 = 0 mm (D)
D3LM#	Real	Length of line 3/match	0 = 0 mm (D)
BKPT#	Real	Breakpoint frequency	0 = 0 GHz (D)
REFT%	Integer	Reflection type	0 = Reflective device greater than Z0 (D) 1 = Reflective device less than Z0
OFFLR#	Real	Reflective devices offset length	0 = 0 mm (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM LRL/LRL Coaxial Calibration parameters
CALL W360BCAL.lrl.line(LM%,LT%,REFZ#,ISO%,REFPL%,NUMB%,D1L1R#,
D2LM#,D3LM#,BKPT#,REFT%,OFFLR#)
```

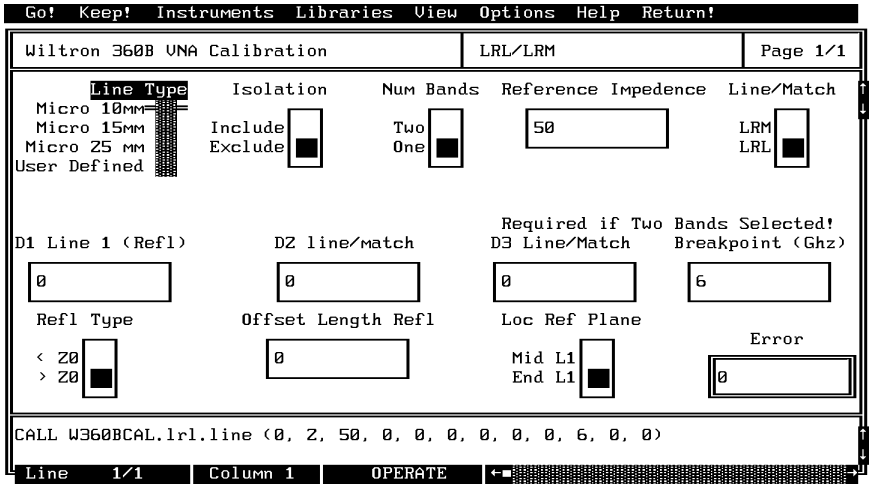
Microsoft C:

```
/* LRL/LRL Coaxial Calibration parameters */
W360BCAL_lrl_line(LM,LT,REFZ,ISO,REFPL,NUMB,D1L1R,
D2LM,D3LM,BKPT,REFT,OFFLR)
```

lrl.line

Function Panel Name: LRL/LRM Calibration Setup (Microstrip)

Description: This function lets users define the setup parameters for a microstrip LRL/LRM type of calibration.



Controls:

Line Type: Lets users select the type of calibration kit they will use in the measurement: 10 Mil, 15 Mil, 25 Mil, or User Defined.

Isolation Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Num Bands Lets users select between one band for a two-line calibration or two bands for a three-line calibration. The number of included lines determines the frequency range. Two lines limit you to a 9:1 span; whereas, three lines permit a 81:1 span.

Reference Impedance (360B only) Lets users enter the system reference impedance (Zo).

Line/Match	Lets users select between line-reflect-line (LRL) or line-reflect-match (LRM) calibration.
D1 Line 1 (Refl)	Lets users enter the length of Line 1, for an LRL or LRM calibration.
D2 L ine/Match	Lets users enter the length of Line 2, for an LRL calibration, or is set to zero for the lowband standard for an LRM calibration.
D3 Line/Match	Lets users enter the length of Line 3, for an LRL calibration, or zero for the highband standard for an LRM calibration (used only for two-band calibrations).
Breakpoint (GHz)	Lets users enter the breakpoint frequency. For two-line LRL calibration, the breakpoint frequency should equal the upper frequency of the low-frequency LRL line. For a combined LRL/LRM calibration, breakpoint frequency should equal the top calibration frequency divided by six. Example: For a frequency range of 0.04 to 60 GHz, the breakpoint should equal 10 GHz (60/6).
Refl Type:	Lets users select between an Open (>Zo) and a Short (<Zo) reflection standard.
Offset Length Refl:	Lets users enter an offset-length value (mm) for the reflection standard.
Loc Ref Plane:	Lets users select a location for their calibration reference planes.
Mid L1	Locates the reference plane at the mid-point of Line 1.
End L1	Locates the reference planes at the ends of Line 1.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
LM%	Integer	Line or match	0 = LRL (D)
LT%	Integer	Line type	1 = Micro 10 mm (D) 2 = Micro 15 mm 3 = Micro 25 mm 4 = User Defined
REFZ#	Real	Reference impedance	50 ohms (D)
ISO%	Integer	Isolation	0 = Exclude isolation 1 = Include isolation (D)
LRL REFPL%	Integer	Reference plane location	0 = Ref plane at ends of line 1 (D) 1 = Ref plane at line 1 midpoint
NUMB%	Integer	Number of bands	0 = 2 line: LRL/LRM (D) 1 = 3 line : LRL/LRM, LRL/LRL, LRM/LRM
D1L#	Real	Length of line 1	0 = 0 mm (D)
D2LM#	Real	Length of line 2/match	0 = 0 mm (D)
D3LM#	Real	Length of line 3/match	0 = 0 mm (D)
BKPT#	Real	Breakpoint frequency	0 = 0 GHz (D)
REFT%	Integer	Reflection type	0 = Reflective device greater than Z0 (D) 1 = Reflective device less than Z0
OFFLR#	Real	Reflective devices offset length	0 = 0 mm (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM LRL/LRL Microstrip Calibration parameters
CALL W360BCAL.lrl.line(LM%,LT%,REFZ#,ISO%,REFPL%,NUMB%,D1L1R#,
D2LM#,D3LM#,BKPT#,REFT%,OFFLR#)
```

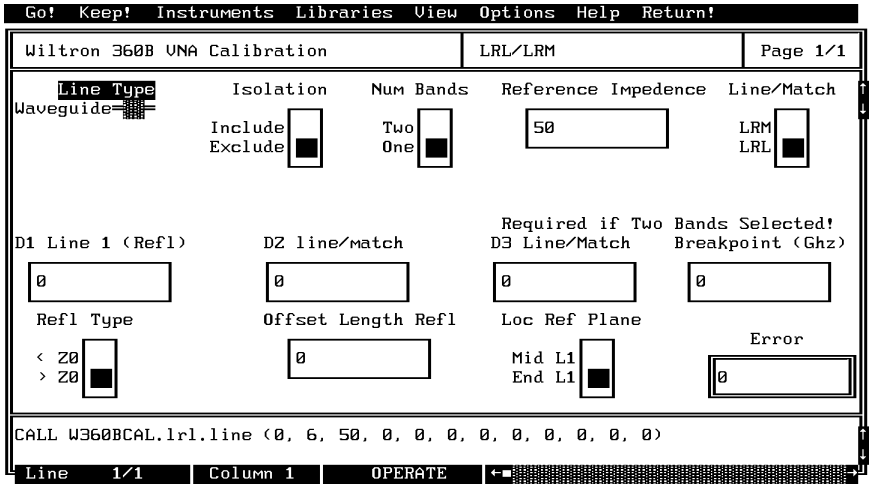
Microsoft C:

```
/* LRL/LRL Microstrip Calibration parameters */
W360BCAL_lrl_line(LM,LT,REFZ,ISO,REFPL,NUMB,D1L1R,D2LM,
D3LM,BKPT,REFT,OFFLR)
```

lrl.line

Function Panel Name: LRL/LRM Calibration Setup (Waveguide)

Description: This function lets users define the setup parameters for a waveguide LRL/LRM type of calibration.



Controls:

Isolation Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Num Bands Lets users select between one band for a two-line calibration or two bands for a three-line calibration. The number of included lines determines the frequency range. Two lines limit you to a 9:1 span; whereas, three lines permit a 81:1 span.

Reference Impedance (360B only)	Lets users enter the system reference impedance (Zo).
Line/Match	Lets users select between line-reflect-line (LRL) or line-reflect-match (LRM) calibration.
D1 Line 1 (Refl)	Lets users enter the length of Line 1, for an LRL or LRM calibration.
D2 L ine/Match	Lets users enter the length of Line 2, for an LRL calibration, or is set to zero for the lowband standard for an LRM calibration.
D3 Line/Match	Lets users enter the length of Line 3, for an LRL calibration, or zero for the value of the highband standard for an LRM calibration (used only for two-band calibrations).
Breakpoint (GHz)	Lets users enter the breakpoint frequency. For two-line LRL calibration, the breakpoint frequency should equal the upper frequency of the low-frequency LRL line. For a combined LRL/LRM calibration, breakpoint frequency should equal the top calibration frequency divided by six. Example: For a frequency range of 0.04 to 60 GHz, the breakpoint should equal 10 GHz (60/6).
Refl Type:	Lets users select between an Open (>Zo) and a Short (<Zo) reflection standard.
Offset Length Refl:	Lets users enter an offset-length value (mm) for the reflection standard.
Loc Ref Plane:	Lets users select a location for their calibration reference planes.
Mid L1	Locates the reference plane at the mid-point of Line 1.
End L1	Locates the reference planes at the ends of Line 1.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
LM%	Integer	Line or match	0 = LRL (D)
LT%	Integer	Line type	0 = Waveguide (D) (Set by program, cannot be reconfigured by use)
REFZ#	Real	Reference impedance	50 ohms (D)
ISO%	Integer	Isolation	0 = Exclude isolation 1 = Include isolation (D)
LRL REFPL%	Integer	Reference plane location	0 = Ref plane at ends of line 1 (D) 1 = Ref plane at line 1 midpoint
NUMB%	Integer	Number of bands	0 = 2 line: LRL/LRM (D) 1 = 3 line : LRL/LRM, LRL/LRL, LRM/LRM
D1L#	Real	Length of line 1	0 = 0 mm (D)
D2LM#	Real	Length of line 2/match	0 = 0 mm (D)
D3LM#	Real	Length of line 3/match	0 = 0 mm (D)
BKPT#	Real	Breakpoint frequency	0 = 0 GHz (D)
REFT%	Integer	Reflection type	0 = Reflective device greater than Z0 (D) 1 = Reflective device less than Z0
OFFLR#	Real	Reflective devices offset length	0 = 0 mm (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM LRL/LRL Waveguide Calibration parameters
CALL W360BCAL.lrl.line(LM%,LT%,REFZ#,ISO%,REFPL%,NUMB%,D1L1R#,
D2LM#,D3LM#,BKPT#,REFT%,OFFLR#)
```

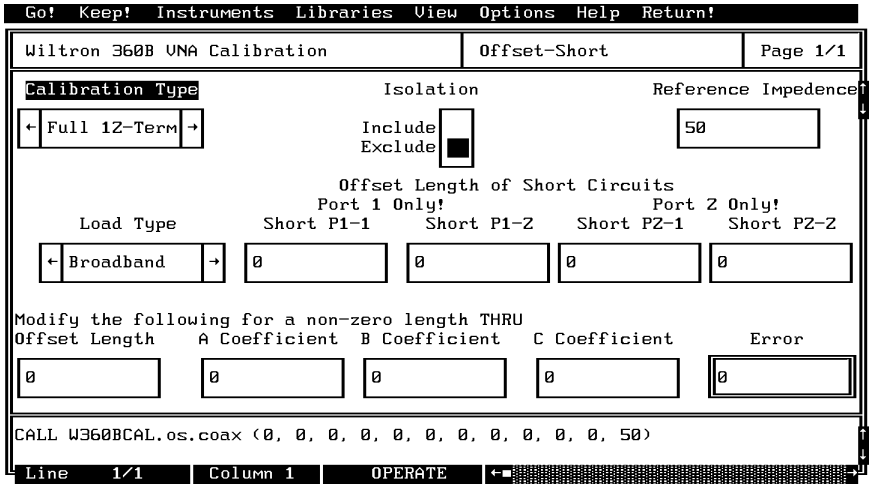
Microsoft C:

```
/* LRL/LRL Waveguide Calibration parameters */
W360BCAL_lrl_line(LM,LT,REFZ,ISO,REFPL,NUMB,D1L1R,D2LM,D3LM,
BKPT,REFT,OFFLR)
```

os.coax

Function Panel Name: Offset-Short Calibration Setup (Coax)

Description: This function lets users define the setup parameters for an offset-short coaxial callibration.



Controls:

Calibration Type — Lets users select a calibration type: Full 12 Term, 1 Path, 2 Port, Frequency Response, Reflection Only. A discussion of what these terms mean and under what conditions each might be used is presented in the Section 3 of the 360B Operating Manual (Part No. 10410-00110).

Isolation — Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Reference Impedance (360B only) — Lets users enter the system reference impedance (Zo).

Load Type — Lets users select between two load types: broadband or sliding. If the measurement requires the highest degree of precision, the user should choose "Sliding"; otherwise the user should chose "Broadband." Refer to the *360B Network Analyzer Getting Started* manual (Part No. 11410-00111) for a discussion of load types, and to the 360B Operating Manual, Section 8, for a procedure on using sliding loads.

Short P1-1 — Lets users enter the length that the Short device #1 is offset from the Port 1 reference plane.

Short P1-2 — Lets users enter the length that the Short device #2 is offset from the Port 1 reference plane.

Short P2-1 — Lets users enter the length that the Short device #1 is offset from the Port 2 reference plane.

Short P2-2 — Lets users enter the length that the Short device #2 is offset from the Port 2 reference plane.

Offset Length — Lets users enter the length of a non-zero-length through line, if necessary. The throughline loss equation is defined by a dc coefficient (A), a frequency coefficient (B), and a frequency exponent (C). The equation:

$$Loss\ (dB/m) = A + B \times (Frequency)^{C}$$

A Coefficient — Lets users enter a value for the dc coefficient (see above).

B Coefficient — Lets users enter a value for the frequency coefficient (see above).

C Coefficient — Lets users enter a value for the frequency exponent (see above).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CALT%	Integer	Calibration types	0 = 12-term Calibration (D) 1 = 1 Path, 2 Port Calibration 2 = Frequency Response Calibration 3 = Transmission Frequency Response Calibration 4 = Reflection Frequency Response Calibration 5 = Transmission and Reflection Frequency Response Calibration
LDT%,	Integer	Loadtype	0 = Broadband 1 = Sliding Load (D)
ISO%	Integer	Isolation	0 = Include Isolation (D) 1 = Exclude Isolation
OFFL#	Real	Offset length	0 mm (D)
ACOEF#	Real	Length coefficient for non-zero length thruline	0 dB/m (D)
BCOEF#	Real		0 dB/(m-FREQ^C) (D)
CCOEF#	Real		0 (D)
SHP11#	Real	OS Short 1 Port 1	0 mm (D)
SHP12#	Real	OS Short 2 Port 1	0 mm (D)
SHP21#	Real	OS Short 1 Port 2	0 mm (D)
SHP22#	Real	OS Short 2 Port 2	0 mm (D)
REFZ#	Real	Reference Impedance	50 Ohm (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM Offset-Short coaxial calibration parameters
CALL W360BCAL.os.coax(CALT%,LDT%,ISO%,OFFL#,ACOEF#,
BCOEF#,CCOEF#,SHP11#,SHP12#,SHP21#,SHP22#,REFZ#)
```

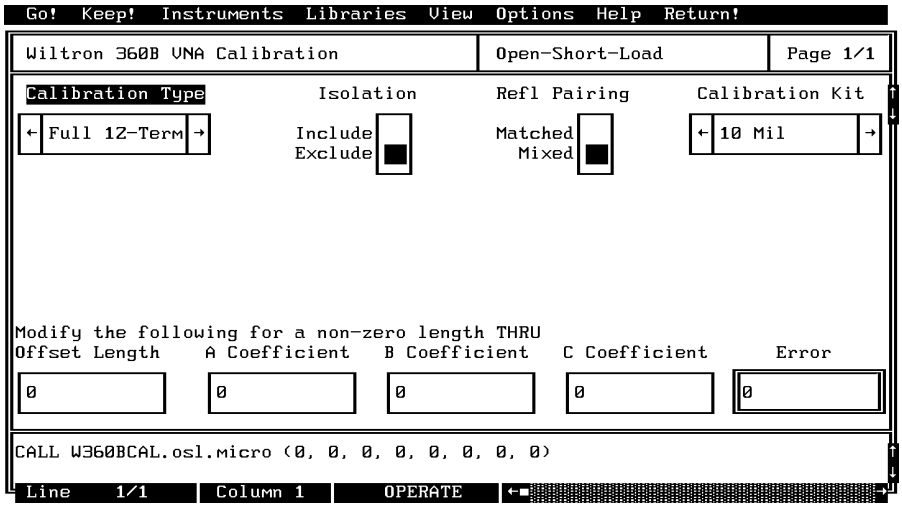
Microsoft C:

```
/* Offset-Short coaxial calibration parameters */
W360BCAL_os_coax(CALT,LDT,ISO,OFFL,ACOEF,BCOEF,CCOEF,SHP11,
SHP12,SHP21,SHP22,REFZ)
```

os.micro

Function Panel Name: Offset-Short Calibration Setup (Microstrip)

Description: This function lets users define the setup parameters for an offset-short calibration in microstrip.



Controls:

Calibration Type Lets users select a calibration type: Full 12 Term, 1 Path, 2 Port, Frequency Response, Reflection Only. A discussion of what these terms mean and under what conditions each might be used is presented in the Section 3 of the 360B Operating Manual (Part No. 10410-00110).

Isolation Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Calibration Kit Lets users select the type of calibration kit they will use in the measurement: 10 Mil, 15 Mil, 25 Mil, or User Defined.

Short P1-1 Lets users enter the length that the Short device #1 is offset from the Port 1 reference plane.

Short P1-2 Lets users enter the length that the Short device #2 is offset from the Port 1 reference plane.

Short P2-1 Lets users enter the length that the Short device #1 is offset from the Port 2 reference plane.

Short P2-2 Lets users enter the length that the Short device #2 is offset from the Port 2 reference plane.

Offset Length Lets users enter the length of a non-zero-length through line, if necessary.The throughline loss equation is defined by a dc coefficient (A), a frequency coefficient (B), and a frequency exponent (C). The equation:

$$Loss\ (dB/m) = A + B\ x\ (Frequency)^{C}$$

A Coefficient Lets users enter a value for the dc coefficient (see above).

B Coefficient Lets users enter a value for the frequency coefficient (see above).

C Coefficient Lets users enter a value for the frequency exponent (see above).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CALT%	Integer	Calibration types	0 = 12-term Calibration (D) 1 = 1 Path, 2 Port Calibration 2 = Frequency Response Calibration 3 = Transmission Frequency Response Calibration 4 = Reflection Frequency Response Calibration 5 = Transmission and Reflection Frequency Response Calibration
ISO%	Integer	Isolation	0 = Include Isolation (D) 1 = Exclude Isolation
CLKIT%	Integer	Calibration Kit	0 = 10mm (D) 1 = 15mm 2 = 25mm 3 = User Defined
OFFL#	Real	Offset length	0mm (D)
ACOEF#	Real	Length coefficient for non-zero length thruline	0 dB/m (D)
BCOEF#	Real		0 dB/(m-FREQ^C) (D)
CCOEF#	Real		0 (D)
SHP11#	Real	OS Short 1 Port 1	0mm (D)
SHP12#	Real	OS Short 2 Port 1	0mm (D)
SHP21#	Real	OS Short 1 Port 2	0mm (D)
SHP22#	Real	OS Short 2 Port 2	0mm (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM Offset-Short microstrip calibration parameters
CALL W360BCAL.os.micro(CALT%,ISO%,CLKIT%,OFFL#,ACOEF#,
BCOEF#,CCOEF#,SHP11#,SHP12#,SHP21#,SHP22#)
```

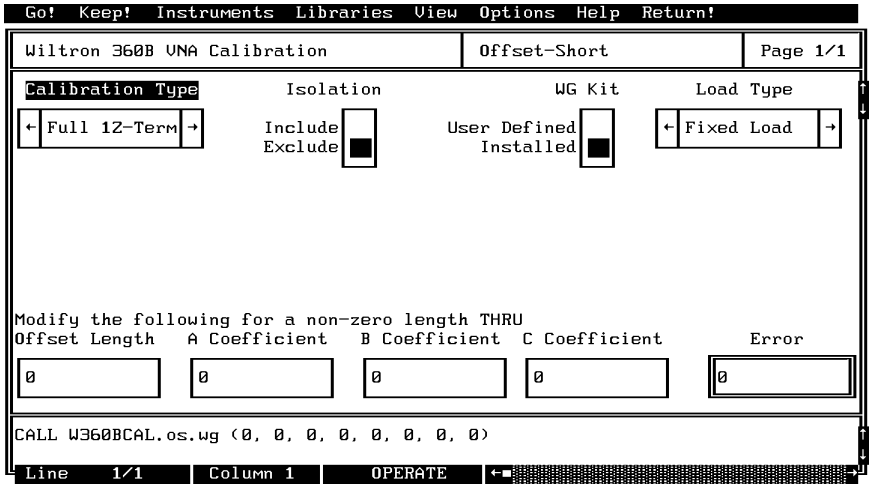
Microsoft C:

```
/* Offset-Short microstrip calibration parameters */
W360BCAL_os_micro(CALT,ISO,CLKIT,OFFL,ACOEF,BCOEF,CCOEF,
SHP11,SHP12,SHP21,SHP22)
```

os.wg

Function Panel Name: Offset-Short Calibration Setup (Waveguide)

Description: This function lets users define the setup parameters for an an offset short calibration in waveguide.



Controls:

Calibration Type Lets users select a calibration type: Full 12 Term, 1 Path, 2 Port, Frequency Response, Reflection Only. A discussion of these terms is presented in Section 3 of the 360B Operating Manual (Part No. 10410-00110).

Isolation Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

WG Kit Lets users select between User Defined and Installed for their waveguide kit.

User Defined: Requires the user to have previously enter values for calibration components.

Installed: Uses values that are have been previously installed from a calibration-coefficients disk.

Offset Length Lets users enter the length of a non-zero-length through line, if necessary.The throughline loss equation is defined by a dc coefficient (A), a frequency coefficient (B), and a frequency exponent (C). The equation:

$$Loss\ (dB/m) = A + B \times (Frequency)^{C}$$

A Coefficient Lets users enter a value for the dc coefficient (see above).

B Coefficient Lets users enter a value for the frequency coefficient (see above).

C Coefficient Lets users enter a value for the frequency exponent (see above).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CALT%	Integer	Calibration types	0 = 12-term Calibration (D) 1 = 1 Path, 2 Port Calibration 2 = Frequency Response Calibration 3 = Transmission Frequency Response Calibration. 4 = Reflection Frequency Response Calibration 5 = Transmission and Reflection Frequency Response Calibration
LTD%	Integer	Load type	0 = Fixed load (D) 1 = Sliding
ISO%	Integer	Isolation	0 = Include Isolation (D) 1 = Exclude Isolation
OFFL#	Real	Offset length	0 mm (D)
ACOEF#	Real	Length coefficient for non-zero length thruline	0 dB/m (D)
BCOEF#	Real		0 dB/(m-FREQ^C) (D)
CCOEF#	Real		0 (D)
WGKIT%	Integer	Waveguide Calibration Kit	0 = Installed (D) 1 = User Defined

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM Offset-Short waveguide calibration parameters
CALL W360BCAL.os.wg(CALT%,LDT%,ISO%,OFFL#,ACOEF#,BCOEF#,
CCOEF#,WGKIT%)
```

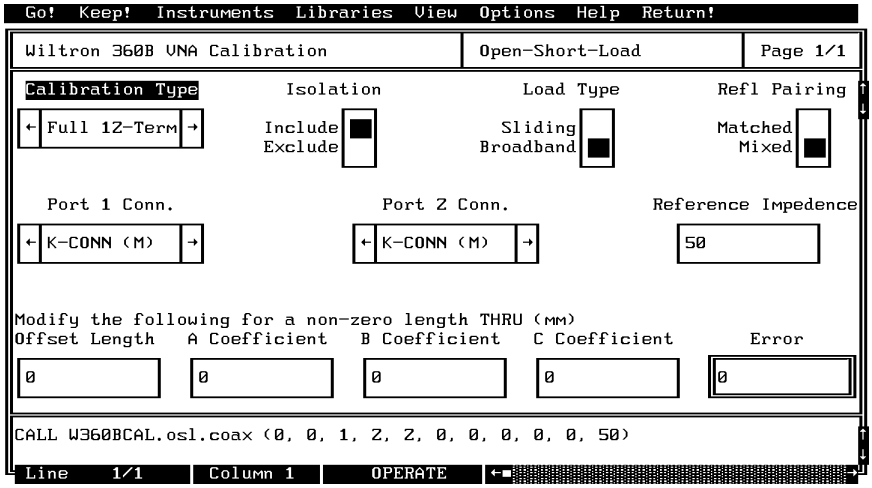
Microsoft C:

```
/*  */
W360BCAL_os_wg(CALT,LTD,ISO,OFFL,ACOEF,BCOEF,CCOEF,WGKIT)
```

osl.coax

Function Panel Name: Open-Short-Load Calibration Setup (Coax)

Description: This function lets users define the setup parameters for an an OSL type calibration.



Controls:

Calibration Type — Lets users select a calibration type: Full 12 Term, 1 Path, 2 Port, Frequency Response, Reflection Only. A discussion of what these terms mean and under what conditions each might be used is presented in the Section 3 of the 360B Operating Manual (Part No. 10410-00110).

Isolation — Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Load Type — Lets users select between two load types: broadband or sliding. If the measurement requires a high-degree of precision, the user should choose "Sliding"; other the user should chose "Broadband." Refer to the *360B Network Analyzer Getting Started* manual (Part No. 11410-00111) for a discussion of load types, and to the 360B Operating Manual, Section 8, for a procedure on using sliding loads.

Refl Pairing (360B only) — Lets users select Matched or Mixed for their reflection pairing. This will dictate the order in which short and open circuit standards are measured.

Matched — Provides for calibrating using first an Open on both ports then a Short on both ports.

Mixed — Provides for calibrating using first an Open on one port and a Short on the other, then a Short on one port and a Open on the other.

Port 1 Conn — Lets users choose the type of connector used for Test Port 1: SMA(M), SMA(F), K-CONN (F), K-CONN(M), TYPE-N (M), TYPE N (F), GPC-3.5 (M), GPC 3.5 (F), GPC-7, or User Defined.

NOTE

Prior to selecting the User-Defined connector (above), users must define the open and short parameter from the `udef.coax` function panel. In other words, the `udef.coax` routine must be executed before the `osl.coax` routine.

Port 2 Conn — Lets users choose the type of connector used for Test Port 2: SMA(M), SMA(F), K-CONN (F), K-CONN(M), TYPE-N (M), TYPE N (F), GPC-3.5 (M), GPC 3.5 (F), GPC-7, or User Defined. See above note.

Reference Impedance (360B only) — Lets users enter the system reference impedance (Zo).

Offset Length — Lets users enter the length of a non-zero-length through line, if necessary. The throughline loss equation is defined by a dc coefficient (A), a frequency coefficient (B), and a frequency exponent (C). The equation:

$$Loss\ (dB/m) = A + B \times (Frequency)^{C}$$

A Coefficient — Lets users enter a value for the dc coefficient (see above).

B Coefficient — Lets users enter a value for the frequency coefficient (see above).

C Coefficient — Lets users enter a value for the frequency exponent (see above).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CALT%	Integer	Calibration types	0 = 12-term Calibration (D) 1 = 1 Path, 2 Port Calibration 2 = Frequency Response Calibration 3 = Transmission Frequency Response Calibration 4 = Reflection Frequency Response Calibration 5 = Transmission and Reflection Frequency Response Calibration
LTD%	Integer	Load type	0 = Broadband (D) 1 = Sliding
ISO%	Integer	Isolation	0 = Exclude 1 = Include (D)
P1CON%	Integer	P1 connector type	0 = SMA (M) 1 = SMA (F) 2 = K CONN (M) (D) 3 = K CONN (F) 4 = TYPE N (M) 5 = TYPE N (F) 6 = GPB – 3.5 (M) 7 = GPB – 3.5 (F) 8 = GPB 7 9 = V CONN (M) 10 = V CONN (F) 11 = TNC (M) 12 = TNC (F) 13 = 2.4 mm (M) 14 = 2.4 mm (F) 15 = User Defined (See NOTE on previous page.)
P2CON%	Integer	P2 connector type	
OFFL#	Real	Offset length of THRU	
ACOEF#	Real	Loss coefficient	0 dB/m (D)
BCOEF#	Real		0 dB/(m-FREQ^C) (D)
CCOEF#	Real		0 (D)
REFP%	Integer	Reflection pairing	0 = Mix (D) 1 = Matched
REFZ#	Real	Reference impedeance	50 ohms (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM Offset-Short-Load coaxial calibration parameters
CALL W360BCAL.osl.coax(CALT%,LDT%,ISO%,P1CON%,P2CON%,OFFL#,
ACOEF#,BCOEF#,CCOEF#,REFP%,REFZ#)
```

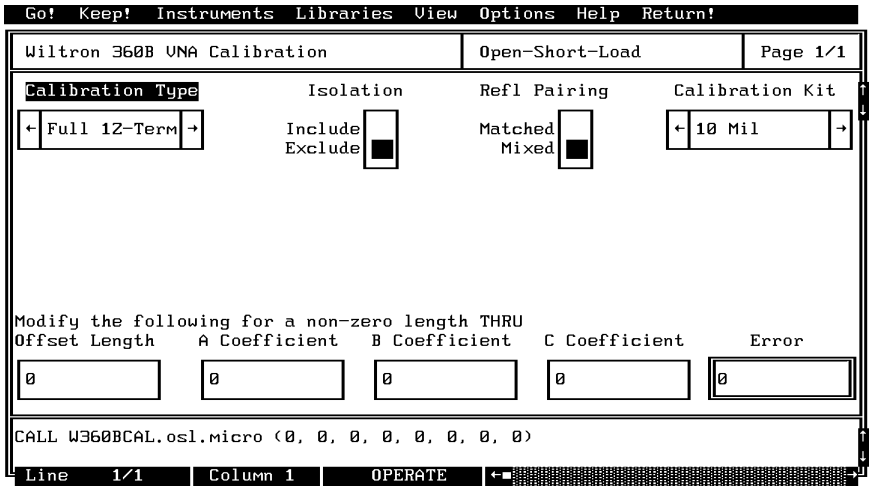
Microsoft C:

```
/* Offset-Short-Load coaxial calibration parameters */
W360BCAL_osl_coax((CALT,LDT,ISO,P1CON,P2CON,OFFL,ACOEF,BCOEF,
CCOEF,REFP,REFZ)
```

osl.micro

Function Panel Name: Open-Short-Load Calibration Setup (Microstrip)

Description: This function users define the setup parameters for an an OSL calibration in microstrip.



Controls:

Calibration Type Lets users select a calibration type: Full 12 Term, 1 Path, 2 Port, Frequency Response, Reflection Only. A discussion of what these terms mean and under what conditions each might be used is presented in the Section 3 of the 360B Operating Manual (Part No. 10410-00110).

Isolation Lets users select whether to include or exclude the error terms associated with leakage between measurement channels (isolation). For a normal calibration, you should include these error terms.

Refl Pairing (360B only) Lets users select Matched or Mixed for their reflection pairing. This will dictate the order in which short and open circuit standards are measured.

Matched — Provides for calibrating using first an Open on both ports then a Short on both ports.

Mixed — Provides for calibrating using first an Open on one port and a Short on the other, then a Short on one port and a Open on the other.

Calibration Kit — Lets users select the type of calibration kit they will use in the measurement: 10 Mil, 15 Mil, 25 Mil, or User Defined.

NOTE

Prior to selecting the User-Defined connector (above), users must define the open and short parameter from the `udef.micro` function panel. In other words, the `udef.micro` routine must be executed before the `osl.micro` routine.

Offset Length — Lets users enter the length of a non-zero-length through line, if necessary.The throughline loss equation is defined by a dc coefficient (A), a frequency coefficient (B), and a frequency exponent (C). The equation:

$$Loss\ (dB/m) = A + B \times (Frequency)^{C}$$

A Coefficient — Lets users enter a value for the dc coefficient (see above).

B Coefficient — Lets users enter a value for the frequency coefficient (see above).

C Coefficient — Lets users enter a value for the frequency exponent (see above).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CALT%	Integer	Calibration types	0 = 12-term Calibration (D) 1 = 1 Path, 2 Port Calibration 2 = Frequency Response Calibration 3 = Transmission Frequency Response Calibration 4 = Reflection Frequency Response Calibration 5 = Transmission and Reflection Frequency Response Calibration
ISO%	Integer	Isolation	0 = Exclude (D) 1 = Include
CLKIT%	Integer	Calibration Kit	0 = 10mm (D) 1 = 15mm 2 = 25mm 3 = User Defined (See NOTE on previous page).
OFFL#	Real	Offset length of THRU	0 mm (D)
ACOEF#	Real	Loss coefficient.	0 dB/m (D)
BCOEF#	Real		0 dB/(m-FREQ^C) (D)
CCOEF#	Real		0 (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360BCAL error codes.

Program Examples:

QuickBASIC:

```
REM Offset-Short-Load microstrip calibration parameters
CALL W360BCAL.osl.miro(CALT%,ISO%,CLKIT%,OFFL#,ACOEF#,BCOEF#,
CCOEF#,REFP%)
```

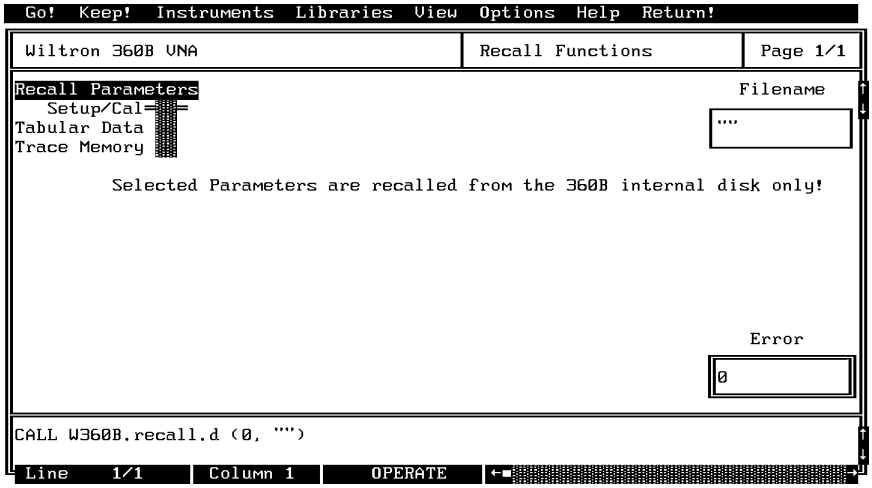
Microsoft C:

```
/* Offset-Short-Load microstrip calibration parameters */
W360BCAL_osl_micro(CALT,ISO,CLKIT,OFFL,ACOEF,BCOEF,CCOEF,REFP)
```

recall.d

Function Panel Name: Recall Functions

Description: This function lets users recall a variety of instrument information from the 360B internal floppy disk



Controls:

Recall Parameter Lets users select the type of data that is to be recalled.

Setup/Cal Recalls a front panel setup and calibration from the 360B internal disk drive.

Tabular Data Recalls tabular data from the 360B internal disk drive and sends it to the attached system printer.

Trace Memory Recalls trace data from the 360B internal disk drive into the currently active channel memory.

Filename Lets users enter the name of the data file to be recalled. The file must be located on the disk in the 360B internal drive.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
RECP%	Integer	Recall parameter	0 = Calibration data (D) 1 = Tabular data 2 = Trace Memory Data
FAME$	String	File name to recall	8 characters, maximum

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

QuickBASIC:

```
REM Recall parameters
CALL W360B.recall.d(RECP%,FAME$)
```

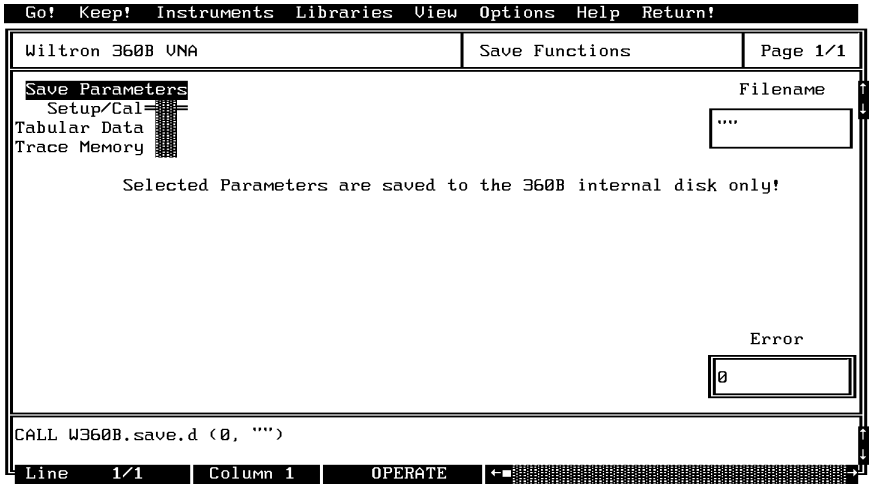
Microsoft C:

```
/* Recall parameters */
W360B_recall_d(RECP,FAME)
```

save.d

Function Panel Name: Save Functions

Description: This function lets users save various information to the 360B internal floppy disk.



Controls:

Save Parameter Lets users select between the different types of data to be saved.

Setup/Cal Saves the current front panel setup and calibration to the 360B internal disk drive.

Tabular Data Saves active-channel-trace data in a tabular-data format to the 360B internal disk drive.

Trace Memory Saves the active-channel trace data memory to the 360B internal disk drive.

Filename Lets users enter the file name for the data to be stored to disk. The file is written to the 360B internal disk drive.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
SAVEP%	Integer	Save parameter	0 = Calibration data (D) 1 = Tabular data 2 = Trace Memory Data
FAME$	String	File name to save	8 characters, maximum

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

QuickBASIC:

```
REM Save parameters
CALL W360B.save.d(SAVP%,FAME$)
```

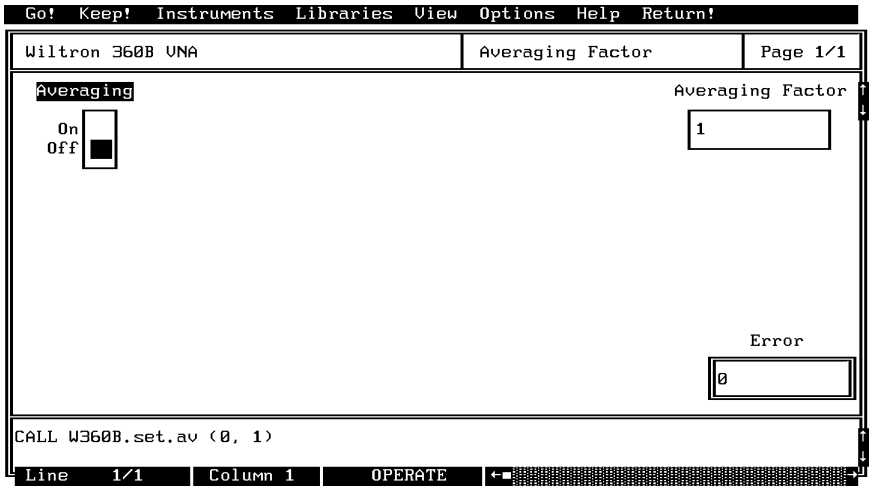
Microsoft C:

```
/* Save parameters */
W360B_save_d(SAVP,FAME)
```

set.av

Function Panel Name: Averaging Factor

Description: This function lets users turn averaging on/off and set the number of averages.



Controls:

Averaging This mode averages the measured data over time. Operationally, the sweep stops at the each frequency point and takes a number of reading, based on the Averaging Factor. The 360B then averages the readings and writes the average value for the measured point to the displayed graph.

On Activates the averaging mode.

Off Deactivates the averaging mode.

Averaging Factor: Lets uses enter a value for the averaging factor (1 to 4096).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
AVON%	Integer	Averaging on/off	0 = Off (D) 1 = On	
AVG%	Integer	Averaging factor	1 (D)	1 to 4096

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Turn Averaging on or off and sets averaging factor.
CALL W360B.set.av(AVON%,AVG%)
```

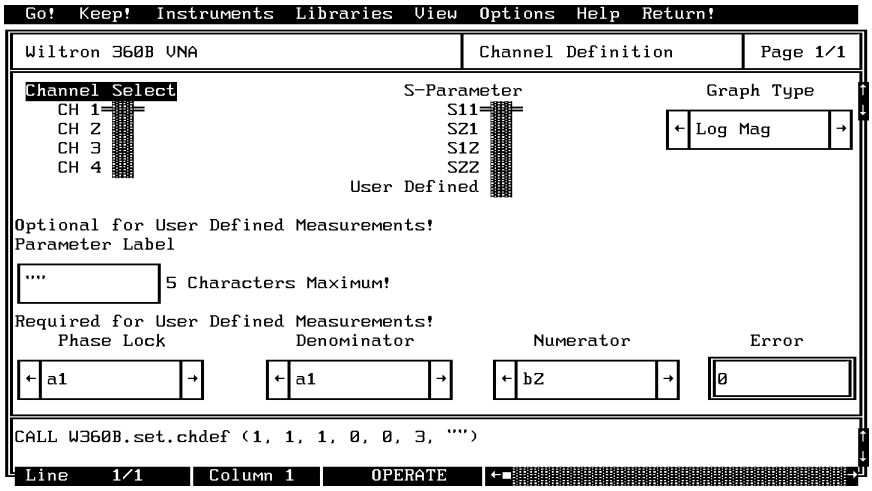
Microsoft C:

```
/* Turn Averaging on or off and sets averaging factor. */
W360B_set_av(AVON,AVG)
```

set.chdef

Function Panel Name: Channel Definition

Description: This function lets users define the 360B diplay for scattering parameters, graph type, an/or user defined measurement parameters.



Controls:

Channel Select: Lets users select a channel to be defined: 1 through 4.

S-Parameter: Lets users select the S-Parameter for the channel being defined.

S11: Selects S_{11} Forward Reflection as the displayed measurement parameter.

S21: Selects S_{21} Forward Transmission as the displayed measurement parameter.

S12: Selects S_{12} Reverse Reflection as the displayed measurement parameter.

S22: Selects S_{22} Reverse Transmission as measurement parameter.

User Defined: Selects a user-defined measurement parameter as defined by the Numerator, Denominator, Phase Lock, and Label entry fields.

Graph Type: Lets users define a graph type for the selected channel: Log Magnitude, Phase, Log Magnitude and Phase, Smith Chart, SWR, Group Delay, Admittance Smith Chart, Linear Polar, Log Polar, Linear Magnitude, Linear Magnitude and Phase, Real, Imaginary, Real and Imaginary.

Parameter Label: Lets users assign a label for their user-defined parameters.

Phase Lock: Lets users select the Phase Lock parameter: a1, a2.

Denominator: Lets users select the Denominator parameter: a1, a2, b1, b2, 1 (unity).

Numerator: Lets users select their Numerator parameter: a1, a2, b1, b2, 1 (unity).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CHSEL%	Integer	Active channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4
SP%	Integer	S-Parameter	1 = S_{11} 2 = S_{21} 3 = S_{12} 4 = S_{22} 5 = User Defined
GT%	Integer	Graph type	1 = Log Mag 2 = Phase 3 = Smith Chart 4 = SWR 5 = Group Delay 6 = Admittance 7 = Lin Polar 8 = Log Polar 9 = Lin Mag 10 = Lin Mag & Phase 11 = Real 12 = Imag 13 = Real & Imag 14 = Log Mag & Phase
PHL%	Integer	Phase lock	0=A1 1=A2 3=NONE
DEN%	Integer	Denominator	0 = A_1 1 = A_2 2 = B_1 3 = B_2 4 = Unity
NUM%	Integer	Numerator	0 = A_1 1 = A_2 2 = B_1 3 = B_2 4 = Unity
PLAB$	String	User defined parameter name.	5 characters, maximum

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Define measurement channel parameters.
CALL W360B.set.chdef (CHSEL%,SP%,GT%,PHL%,DEN%,NUM%,PLAB$)
```

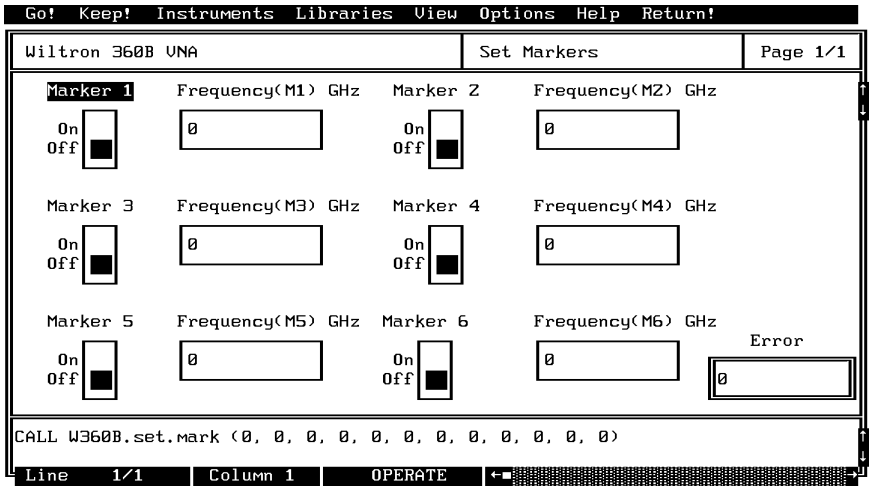
Microsoft C:

```
/* Define measurement channel parameters. */
W360B_set_chdef (CHSEL,SP,GT,PHL,DEN,NUM,PLAB)
```

set.mark

Function Panel Name: Set Markers

Description: This function lets users turn markers on or off and set them to the user-entered frequency.



Controls:

Marker 1: Lets users turn Marker 1 on or off.

Frequency (M1) GHz: Lets users enter a frequency value for Marker 1.

Marker 2: Lets users turn Marker 2 on or off.

Frequency (M2) GHz: Lets users enter a frequency value for Marker 2.

Marker 3: Lets users turn Marker 3 on or off.

Frequency (M3) GHz: Lets users enter a frequency value for Marker 3.

Marker 4: Lets users turn Marker 4 on or off.

Frequency (M4) GHz: Lets users enter a frequency value for Marker 4.

Marker 5: Lets users turn Marker 5 on or off.

Frequency (M5) GHz: Lets users enter a frequency value for Marker 5.

Marker 6: Lets users turn Marker 6 on or off.

Frequency (M6) GHz: Lets users enter a frequency value for Marker 6.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
MKx%	Integer	Marker x on/off (x = marker to set)	0 = Off(D) 1 = On	1 to 9
MKFx#	Real	Marker frequency (x = marker to set)	GHz	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Set markers.
CALL W360B.set.mark(MK1%,MKF1#,MK2%,MKF2#,MK3%,MKF3#,MK4%,
MKF4#,MK5%,MKF5#,MK6%,MKF6#)
```

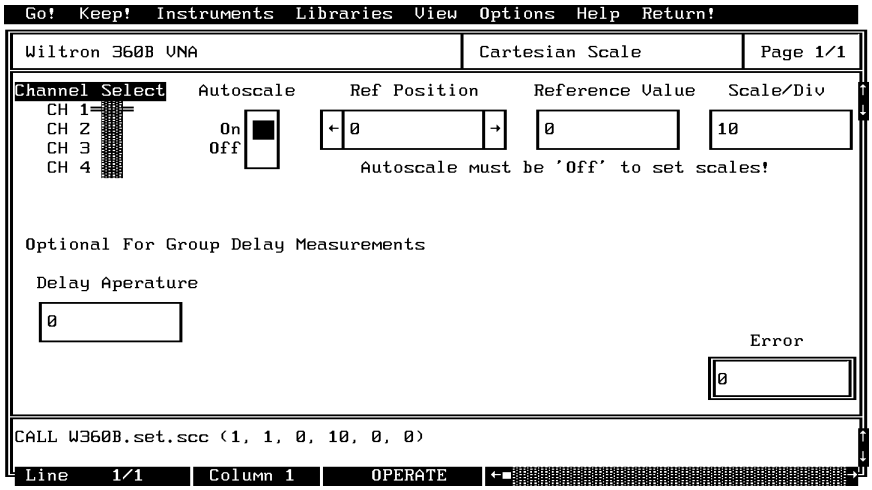
Microsoft C:

```
/* Set markers. */
W360B_set_mark(MK1,MKF1,MK2,MKF2,MK3,MKF3,MK4,MKF4,MK5,MKF5,
MK6,MKF6)
```

set.scc

Function Panel Name: Cartesian Scale

Description: This function lets users set the display scale for cartesian (X-Y) graphs.



Controls:

Channel Select: Lets users select the active channel to be scaled: 1 through 4.

Autoscale: Lets users select Autoscale to be on or off. When on, display scaling is automatically set based on measurement signal value. Autoscale must be set to off if User Defined scaling is used.

Ref Position: Lets users set a reference marker position value.

Ref Value: Lets users set a reference value.

Scale/Div: Lets users set a value for the vertical scale.

Delay Aperature: Lets users set aperature delay for Group Delay Measurements.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
CHSEL%	Integer	Active channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4	
AC%	Integer	Autoscale	0 = Off 1 = On (D)	
REFP%	Integer	Reference position	0 (D)	1 thru 8
SCALE#	Real	Scale for display	10 (D)	0.01 to 90 degrees per division
REFV#	Real	Reference value	0 (D)	
GD#	Real	Delay aperature	0 (D)	0 to 20%

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Set cartesian scale values.
CALL W360B.set.scc(CHSEL%,AC%,REFP%,SCALE#,REFV#,GD#)
```

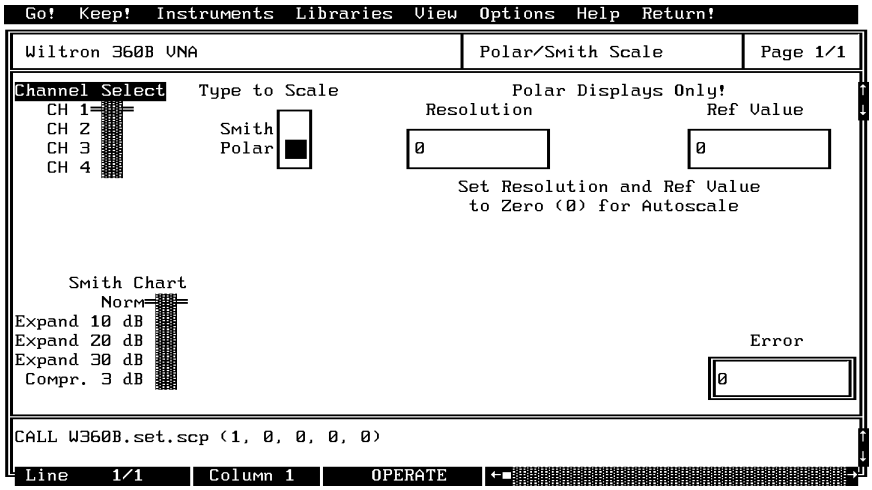
Microsoft C:

```
/* Set cartesian scale values. */
W360B_set_scc(CHSEL,AC,REFP,SCALE,REFV,GD)
```

set.scp

Function Panel Name: Polar/Smith Scale

Description: This function lets users set Polar/Smith chart scale parameters.



Controls:

Channel Select: Lets users select the active channel to scaled: 1 through 4.

Type to Scale: Lets users select between Smith and Polar graph types.

Resolution: Lets users set resolution value for only polar displays.

Ref Value: Lets users set a reference value for only polar displays.

Smith Chart: Lets users select between the five available Smith Charts: Normal, 10 dB expansion, 20 dB expansion, 30 dB expansion, or 3 dB compression.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CHSEL%	Integer	Active channel	1 = Channel 1 2 = Channel 2 3 = Channel 3 4 = Channel 4
TPE%	Integer	Type: Autoscale on/off	0 = On (D) 1 = Off
SMS%	Integer	Graph type: polar or Smith chart. If Polar is selected, then RES# and REFV# are used. If Smith Chart is selected, the values for "0" through "4" under "Details" are used.	0 = Polar 1 = Smith Chart 0 = Norm 1 = 10dB 2 = 20dB 3 = 30dB 4 = 3dB Compressed
RES#	Real	Resolution (Only for Polar chart.)	1 (D) (If no value is assigned, the display will be autoscaled)
REFV#	Real	Reference value (Only for Polar chart.)	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Set Smith/polar scale values.
CALL W360B.set.scp(CHSEL%,TPE%,SMS%,RES#,REFV#)
```

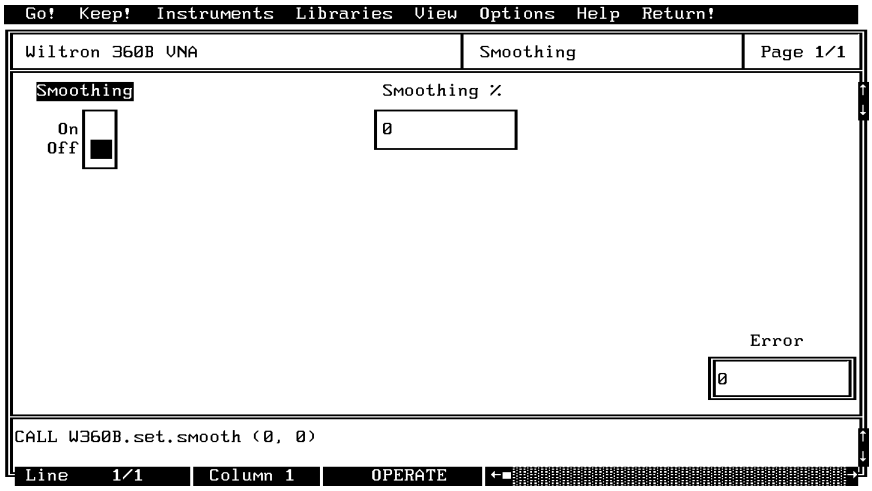
Microsoft C:

```
/* Set Smith/polar scale values. */
W360B_set.scp(CHSEL,TPE,SMS,RES,REFV)
```

set.smooth

Function Panel Name: Smoothing

Description: This function lets users set data-trace smoothing on or off and enter a smoothing percentage



Controls:

Smoothing: Lets users turn smoothing on or off. The smoothing process uses a raised Hamming window to average the data from a span of frequencies.

Smoothing % Lets users enter a percentage of the span value for smoothing.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
SMOOTHING%	Integer	Smoothing on/off.	0 = Off (D) 1 = On	
SMOOTH%	Integer	Smoothing factor	0 (D)	0.1 to 20%

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Set smoothing value.
CALL W360B.set.smooth(SMOOTHING%,SMOOTH%)
```

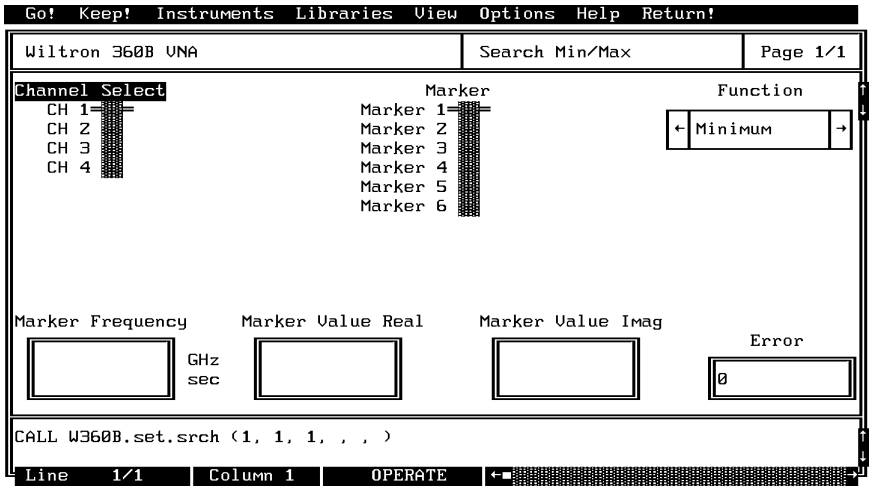
Microsoft C:

```
/* Set smoothing value. */
W360B_set_smooth(SMOOTHING,SMOOTH)
```

set.srch

Function Panel Name: Search Min/Max

Description: This function lets users search for the minimum or maximum measured value. Once found, the frequency and value of the search point is returned.



Controls:

Channel Select: Lets users select the active channel: 1 through 4.

Marker: Lets users select the active marker.

Function: Lets users select whether marker is to search for the minimum or maximum displayed value.

Marker Frequency: Displays the returned marker frequency or time position from the 360B.

Marker Value Real: Displays the returned marker real (magnitude) value from the 360B.

Marker Value Imag: Displays the returned marker imaginary (phase) value from the 360B.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
CHSEL%	Integer	Active channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4	
MK%	Integer	Marker selected	1 = Marker 1 (D)	1 thru 6
FUNC%	Integer	Marker function	1 = Marker to minimum (D) 2 = Marker to Maximum	
MKV#	Real	Marker real value	returned variables	
MKVI#	Real	Marker imaginary value		
MKVF#	Real	Marker frequency		

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Sets marker min/max search value.
CALL W360B.set.srch(MK%,FUNC%,MKV#,MKVI#,MKVF#)
```

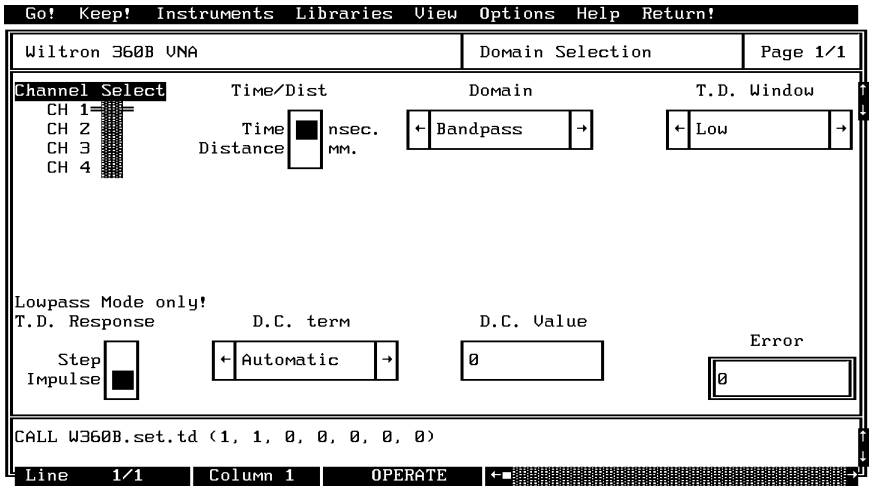
Microsoft C:

```
/*  */
W360B_set_srch(MK,FUNC,MKV,MKVI,MKVF)
```

set.td

Function Panel Name: Domain Selection

Description: This function lets users set time/distance domain parameters.



Controls:

Channel Select: Lets users select the active channel: 1 through 4.

Time/Dist: Lets users select between time and distance display-unit formats.

Domain: Lets users select the domain mode: Frequency or Frequency With Time Gate, Lowpass, or Bandpass.

T.D. Window: Lets time-domain users select one of four window functions to be applied to the initial frequency data: Rectangular, Nominal-Hamming, Low Side Lobe, and Minimum Side Lobe.

TD Response: Lets users select a time domain response mode: Step or Impulse.

D.C. Term: Lets users select a D.C. term: Automatic, Line Impedance, Open, Short, Other.

D.C. Value: Lets users enter a D.C. term value.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CHSEL%	Integer	Active channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4
TD%	Integer	Time/distance	1 = Time (D) 0 = Distance
DOM%	Integer	Time domain mode	0 = Bandpass (D) 1 = Lowpass 2 = Phasor Imp 3 = Frequency 4 = Frequency to T.G.
TDWIN%	Integer	Time Domain Window	0 = Low (D) 1 = Minimum 2 = Normal 3 = Rectangular
TDRES%	Integer	Time domain response	0 = Impulse (D) 1 = Step
DCRES%	Integer	Direct current resistance	0 = Automatic (D) 1 = Open 2 = Short 3 = Entered
DCVALUE#	Real	Value	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes

Program Examples:

Quick BASIC:

```
REM Selects time or distance domains and sets values.
CALL W360B.set.td(CHSEL%,TD%,DOM%,TDWIN%,TDRES%,DCRES%,DCVALUE#)
```

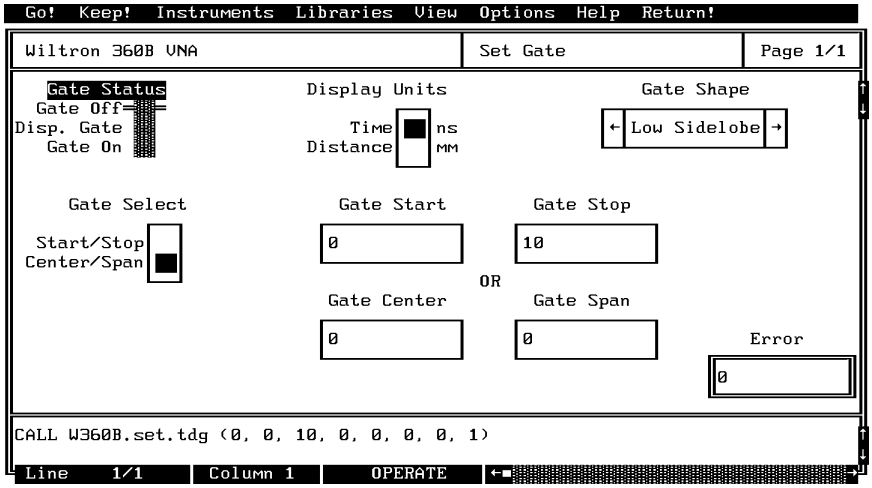
Microsoft C:

```
/* Selects time or distance domains and sets values. */
W360B_set_td(CHSEL,TD,DOM,TDWIN,TDRES,DCRES,DCVALUE)
```

set.tdg

Function Panel Name: Set Gate

Description: This function lets users set time domain gate values.



Controls:

Gate Meas: Lets users select a time domain gating mode: Off, Display, or On.

Gate Select: Lets users select the format of gate positioning: Start/Stop, or Center/Span.

Gate Start/Stop Lets users enter a start and stop time value for the gate.

Gate Stop/Span: Lets users enter a stop and span time value for the gate.

Gate Shape: Lets users select a shape for the gate: Rectangular, Nominal, Low Sidelobe, Min Sidelobe.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
GMEAS%	Integer	Gated measurements	0 = Gate Off (D) 1 = Disp. Gate 1 = Gate On
GSH%	Integer	Gate shape	0 = Low Sidelobe (D) 1 = Minimum Sidelobe 2 = Nominal Sidelobe 3 = Rectilinier Sidelobe
GSTOP#	Real	Gate stop time/distance	10 (D)
GSTART#	Real	Gate start time/distance	0 (D)
GCENT#	Real	Gate center time/distance	0 (D)
GSPAN#	Real	Gate span time/distance	0 (D)
GSEL%	Integer	Gate select	0 = Center/Span 1 = Start/Stop

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Sets time domain gate values.
CALL W360B.set.tdg(GMEAS%,GSH%,GSTOP#,GSTART#,GCENT#,GSPAN#,
GSEL%)
```

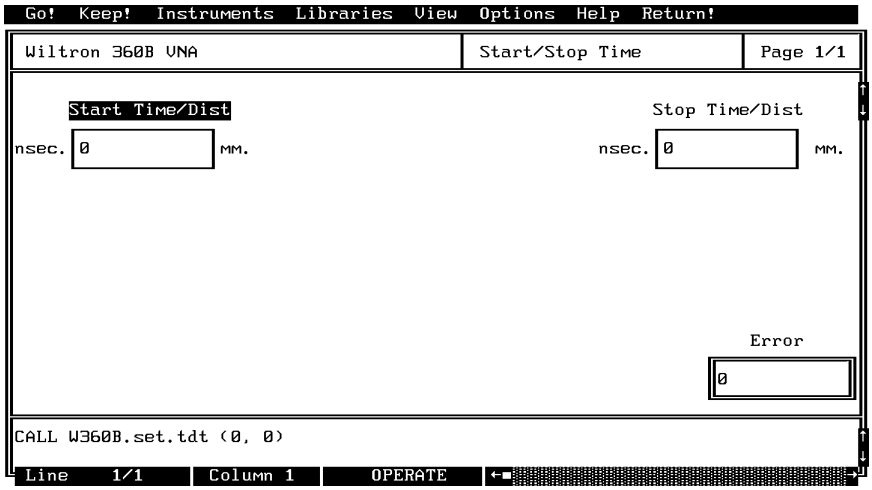
Microsoft C:

```
/* Sets time domain gate values. */
W360B_set_tdg(GMEAS,GSH,GSTOP,GSTART,GCENT,GSPAN, GSEL)
```

set.tdt

Function Panel Name: Start/Stop Time

Description: This function lets users set the time domain start and stop times (or distances).



Controls:

Start Time/Dist: Lets users enter a start time or distance.

Stop Time/Dist: Lets users enter a stop time or distance.

NOTE

Units for start and stop entries should correspond to the currently displayed time domain graph, or to the selection made with the Time/Distance control on the `set.td` function panel.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
START#	Real	Start time/distance	0 mm/ns (D)
STOPT#	Real	Stop time/distance	0 mm/ns (D)

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Sets start and stop times or frequencies.
CALL W360B.set.tdt(START#,STOPT#)
```

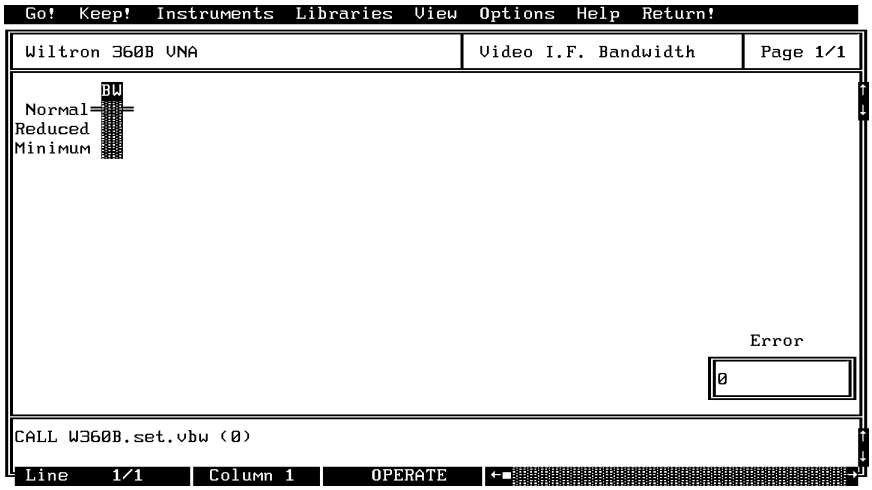
Microsoft C:

```
/* Sets start and stop times or frequencies. */
W360B_set_tdt(START,STOPT)
```

set.vbw

Function Panel Name: Video I.F. Bandwidth

Description: This function lets users set the video intermediate frequency bandwidth.



Controls:

BW: Lets users select one of three bandwidth settings. Normal, Reduced, or Minimum (approximately 10 kHz, 1 kHz, and 100 Hz, respectively).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
BW%	Integer	Video bandwidth	0 = Normal (D) 1 = Reduced 2 = Minimum

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Sets video IF bandwidth.
CALL W360B.set.vbw(BW%)
```

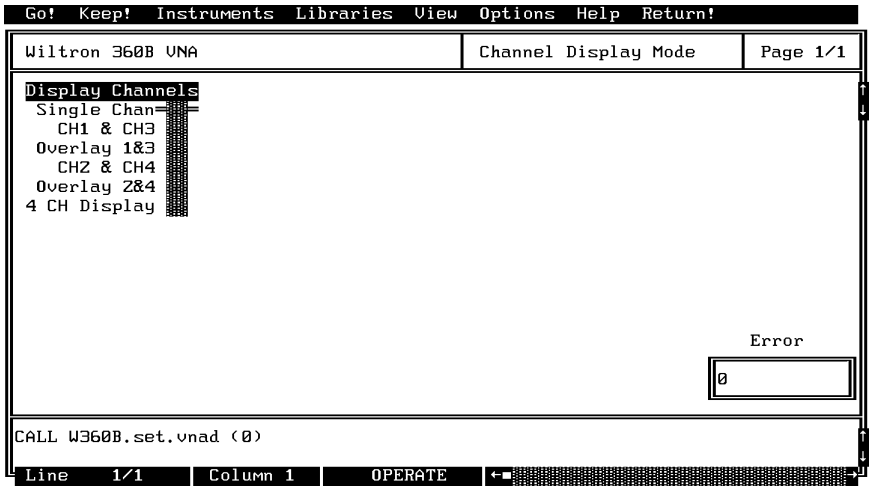
Microsoft C:

```
/* Sets video IF bandwidth. */
W360B_set_vbw(BW)
```

set.vnad

Function Panel Name: Channel Display Mode

Description: This function lets users set the 360B channel display mode.



Controls:

Display Channel:

Single Chan: Single channel display of data on a single channel 1, 2, 3, or 4.

CH1 & CH3: Dual channel display of data on channels 1 and 3.

Overlay 1&3: (360B only) Trace data appearing on channel 1 is overlayed (superimposed) on channel 3 trace.

CH2 & CH4: Dual channel display of data on channels 2 and 4.

Overlay 2&4: (360B only) Trace data appearing on measurement channel 2 is overlayed (superimposed) on channel 4 trace data.

4 CH Display: All four display channels are shown simultaneously.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
CHD%	Integer	Type of display	0 = Single Channel (D) 1 = Channel 1 and Channel 3 2 = Overlay Channel 1 and 3 3 = Channel 2 and Channel 4 4 = Overlay Channel 2 and 4 5 = 4 Channel Display

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

Quick BASIC:

```
REM Sets the display mode.
CALL W360B.set.vnad(CHD%)
```

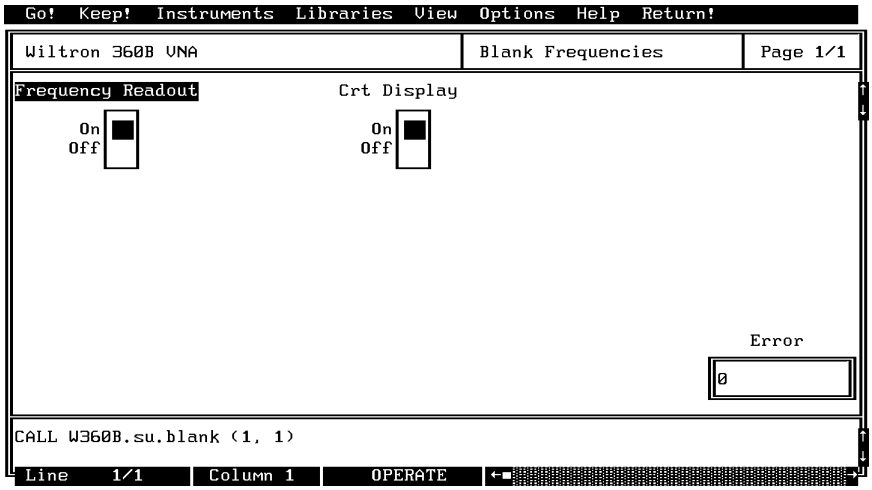
Microsoft C:

```
/* Sets the display mode. */
W360B_set_vnad(CHD)
```

su.blank

Function Panel Name: Blank Frequencies

Description: This function lets users blank the 360B front panel frequency and/or graphic display.



Controls:

Frequency Readout: Lets users turn the frequency readouts on or off.

CRT Display: Lets users turn the CRT display on or off.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
FBL%	Integer	Blank frequencies	0 = Off 1 = On (D)
SCB%	Integer	Blank display	0 = Off 1 = On (D)

Output Parameters: None.

Error: LabWindows error codes(220-300).

Program Examples:

Quick BASIC:

```
REM Blanks frequency readout and front panel display.
CALL W360B.su.blank(FBL%,SCB%)
```

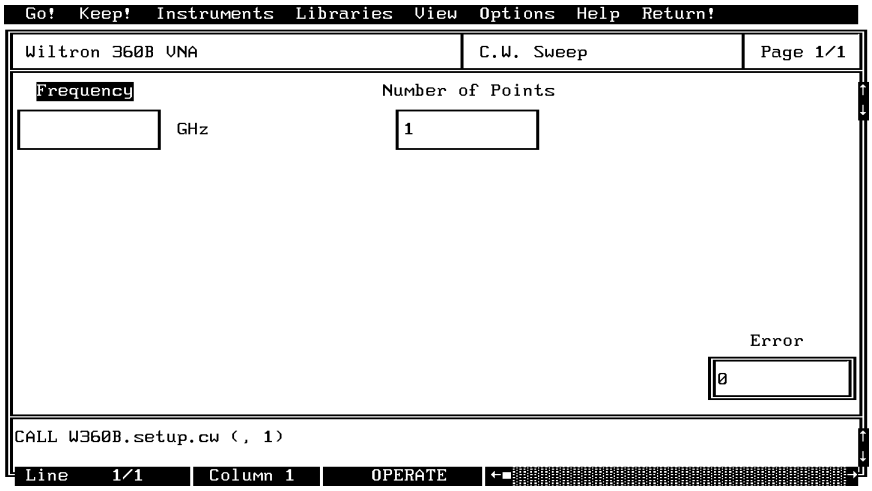
Microsoft C:

```
/* Blanks frequency readout and front panel display. */
W360B_su_blank(FBL,SCB)
```

setup.cw

Function Panel Name: CW Sweep

Description: This function lets users select a CW frequency of operation and the number of data points to be drawn on the W360B display.



Controls:

Frequency: Lets users enter a CW frequency value. This value must be within the current 360B sweep range.

Number of Points: Lets users enter the number of consecutive data points drawn for one sweep.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
FREQ#	Real	CW Frequency	0=(D)	0.01 to 110 GHz, depending on system frequency range.
DPTS%	Integer	Number of points drawn in CW mode	1 (D)	1 to 501

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Sets the cw frequency and number of frequency points for tak-
ing data.
CALL W360B.setup.cw(FREQ#,DPTS%)
```

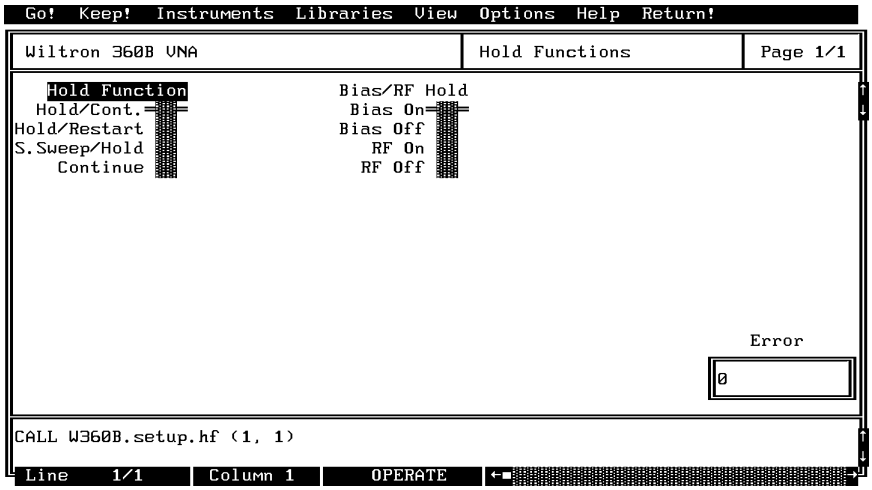
Microsoft C:

```
/* Sets the cw frequency and number of frequency points for
taking data. */
W360B_setup_cw(FREQ,DPTS)
```

setup.hf

Function Panel Name: Hold Functions

Description: This function lets users control the W360B sweep hold and RF/ bias conditions.



Controls:

Hold Function:

Hold/Cont: Holds the sweep cursor at the current frequency point.

Hold/Restart: Causes the sweep cursor to restart a sweep, take one sweep, and hold.

S. Sweep/Hold: Causes the HOLD key to trigger a single sweep and hold with finished. (Two sweeps, one from Port 1 to 2 and another from Port 2 to 1, are accomplished for a 12-term measurement.)

Continue: Places the 360B in a continuous sweep mode.

Bias/RF Hold:

Bias On: Bias remains on for a sweep in hold.

Bias Off: Turns bias off for a sweep in hold.

RF On: RF remains on for a sweep in hold.

RF Off: Turns RF off for a sweep in hold.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
HFUNCT%	Real	Sweep hold functions	1 = Hold/Continue (D) 2 = Hold/Restart 3 = S.Sweep/Hold 4 = Continue
BIASF%	Integer	Bias conditions while sweep is in hold mode. Includes RF as well.	1 = Bias On (D) 2 = Bias Off 3 = RF On 4 = RF Off

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes

Program Examples:

Quick BASIC:

```
REM Sets the hold mode functions.
CALL W360B.setup.hf(HFUNCT%,BIASF%)
```

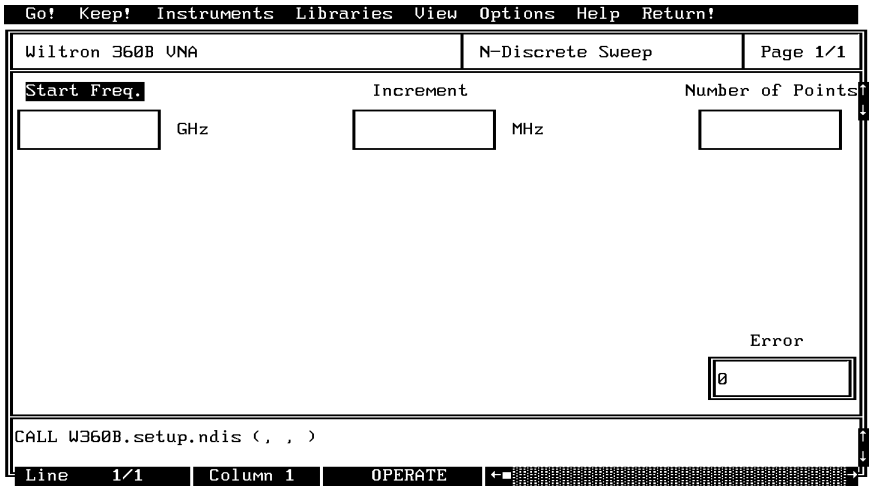
Microsoft C:

```
/* Sets the hold mode functions. */
W360B_setup_hf(HFUNCT,BIASF)
```

setup.ndis

Function Panel Name: N-Discrete Sweep

Description: This function lets users set an N-discrete frequency sweep.



Controls:

Start Freq: Lets users enter the start frequency.

Increment: Lets users enter the frequency increment to be used for the N-Discrete point sweep.

Number of Points: Lets users enter the number of sweep points to be used for the N-Discrete sweep (including the start frequency point).

Input Parameters:

Variable Name	Variable Type	Description	Details	Range
STARTF#	Real	Start frequency		0.01 to 110 GHz, depending on system frequency range.
INC%	Integer	Increment (MHz)		≥100 Hz for 66XX or 360SS based systems ≤1 kHz for 67XX or 681XX based systems
DPTS%	Integer	Number of points		1 to 501

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Sets the N-Discrete sweep parameters.
CALL W360B.setup.ndis(STARTF#,INC#,DPTS%)
```

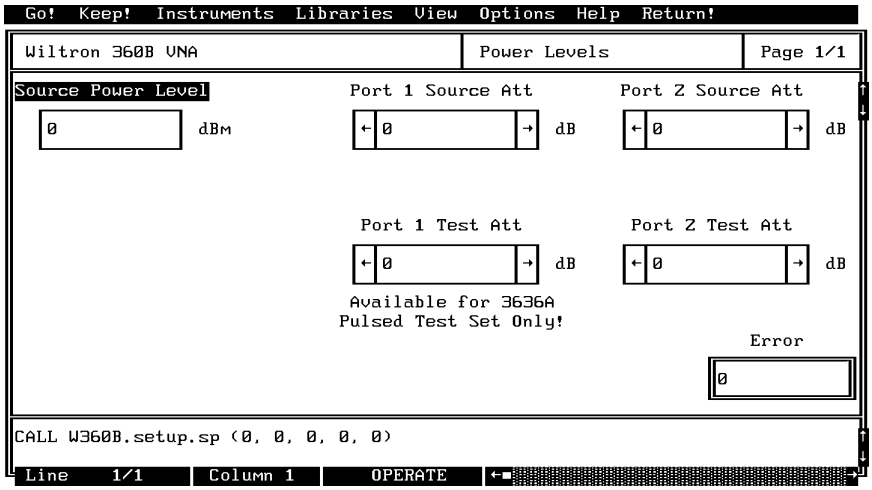
Microsoft C:

```
/* Sets the N-Discrete sweep parameters. */
W360B_setup_ndis(STARTF,INC,DPTS)
```

setup.sp

Function Panel Name: Power Levels

Description: This function lets users set the source power level and the test set attenuators, as available.



Controls:

Source Power Level: Lets users enter a power level for the frequency source (sweep generator or synthesizer).

Port 1 Source Att: Lets users set the attenuation level for the microwave source power at Port 1. The power is attenuated before being applied to Port 1 for a forward transmission or reflection test (S_{21} or S_{11}, respectively).

Port 2 Source Att: Lets users set the attenuation level for the microwave source power at Port 2. The power is attenuated before being applied to Port 2 for a reverse transmission or reflection test (S_{12} or S_{22}, respectively).

Port 1 Test Att: Lets users set the attenuation level for the microwave power being input to Port 1 from the device-under-test (DUT) for Model 3636A Pulse Test Set.

Port 2 Test Att: (Secondary Function) Lets users set the attenuation level for the microwave power being input to Port 2 from the DUT.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
SPL#	Real	Source power level	0 (D)	
P1SA#	Real	Port 1 source attenuator	0 (D)	0 to 70, in 10 dB steps
P2SA#	Real	Port 2 source attenuator	0 (D)	0 to 70, in 10 dB steps
P2TA#	Real	Port 2 test attenuator (Value set by secondary function routine)	0 (D)	0 to 40, in 10 dB steps
PITA#	Real	Port 1 test attenuator	0 (D)	0 to 40, in 10 dB steps

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Sets power levels for frequency source and source and test
attenuators.
CALL W360B.setup.sp(SPL#,P1SA#,P2SA#,PITA#)
```

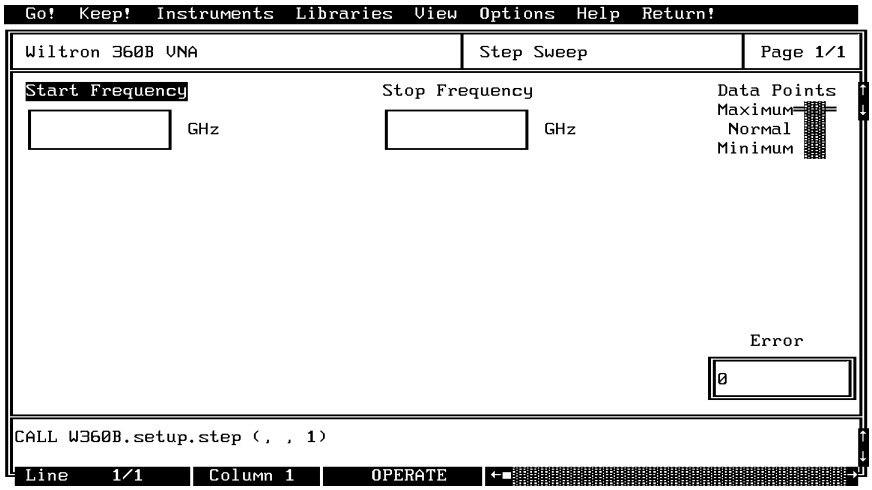
Microsoft C:

```
/* Sets power levels for frequency source and source and test at-
tenuators. */
W360B_setup_sp(SPL,P1SA,P2SA,PITA)
```

setup.step

Function Panel Name: Step Sweep

Description: This function lets users select the 360B start and stop frequencies and the data point display resolution.



Controls:

Start Frequency: Lets users enter a start frequency in GHz for a digital step sweep.

Stop Frequency: Lets users enter a stop frequency in GHz for a digital step sweep.

Data Points: Lets users select the data point resolution for the step sweep: Maximum (up to 501 points), Normal (Maximum Number of Points/3), or Minimum (Maximum Number of Points/6).

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
STARF#	Real	Start frequency		0.01 to 110 GHz, depending on system frequency range.
STOPF#	Real	Stop frequency		
DPTS%	Integer	Display resolution	0 = Normal 1 = Maximum (D) 2 = Minimum	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Sets the start and stop frequency and data-point value for
step sweep.
CALL W360B.setup.step(STARF#,STOPF#,DPTS%)
```

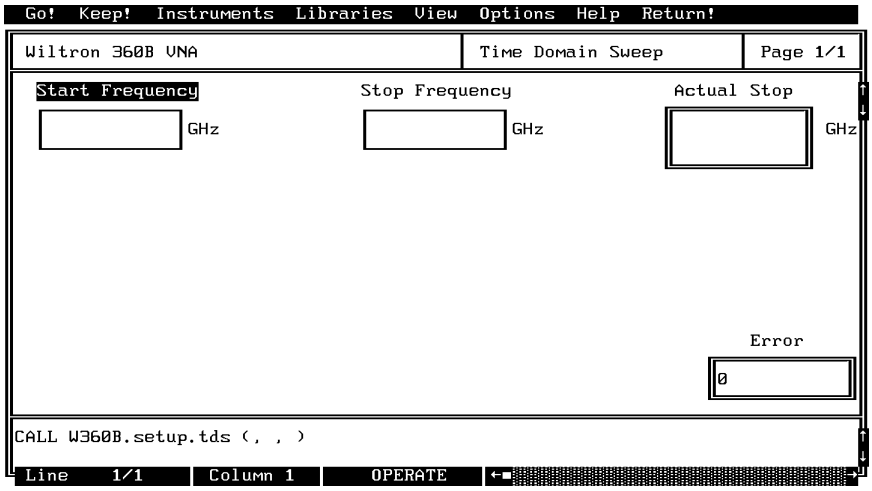
Microsoft C:

```
/* Sets the start and stop frequency and data-point value for
step sweep. */
W360B_setup_step(STARF,STOPF,DPTS)
```

setup.tds

Function Panel Name: Time Domain Sweep

Description: This function lets users define a harmonically related frequency sweep range. The harmonic sweep is necessary for Lowpass Time Domain measurements.



Controls:

Start Frequency: Lets users enter a start frequency value for a time domain sweep.

Stop Frequency: Lets users enter a desired stop frequency value for a time domain sweep.

Actual Stop: Returns the value of the actual stop frequency. In most cases, this value will be the same as the requested stop frequency. However, if the requested stop frequency is not harmonically related to the start frequency, then the 360B calculates and returns the closest possible frequency value. (i.e., actual stop = n X Start Frequency).

Input Parameters:

Variable Name	Variable Type	Description	Range
STARF#	Real	Start frequency	0.01 to 110 GHz, depending on system frequency range.
STOPF#	Real	Stop frequency	
ASTOP#	Real	Returned stop frequency	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Sets the start and stop frequency for time domain sweep.
CALL W360B.setup.tds(STARF#,STOPF#,ASTOP#)
```

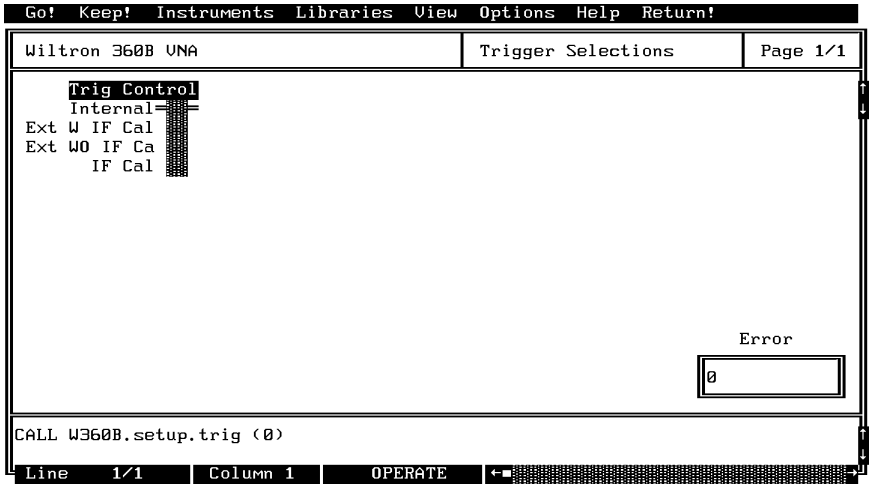
Microsoft C:

```
/* Sets the start and stop frequency for time domain sweep. */
W360B_setup_tds(STARF,STOPF,ASTOP)
```

setup.trig

Function Panel Name: Trigger Selections

Description: This function lets users set 360B trigger control mode.



Controls:

Trig Control:

Internal: Sweep is triggered internally (normal operation).

Ext W IF Cal: Sweep can be triggered from an external source. The IF calibration is enabled (it will occur approximately every 3 minutes).

Ext WO IF Cal: Sweep can be triggered from an external source. The IF calibration is disabled.

IF Cal: Triggers immediate calibration of the test set IF channels.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
TRIGC%	Integer	Trigger control	0 = Internal (D) 1 = External W IF 2 = External WO IF 3 = Internal W IF	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Selects trigger functions.
CALL W360B.setup.trig(TRIGC%)
```

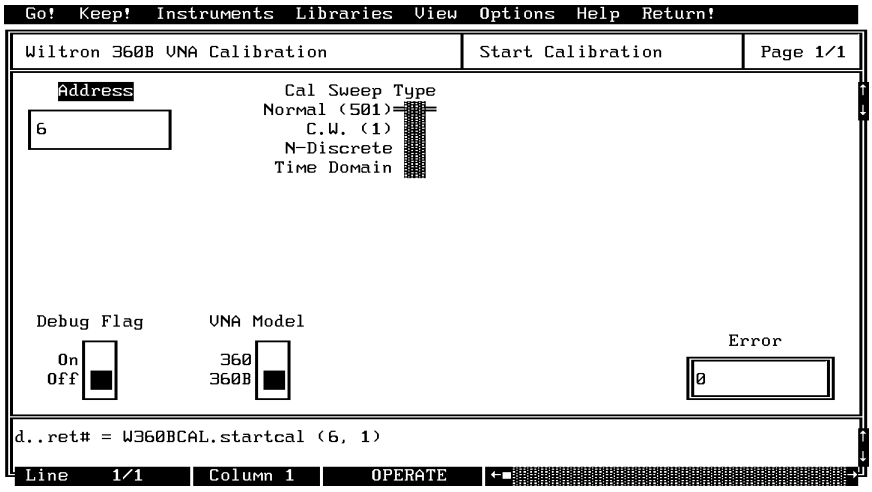
Microsoft C:

```
/* Selects trigger functions. */
W360B_setup_trig(TRIGC%)
```

startcal

Function Panel Name: Start Calibration

Description: This function opens the GPIB communication with the 360B and sets it to its preset state. The device configuration must already be completed. System configuration parameters — such as minimum/maximum frequency, firmware revision, etc., — are returned and displayed.



Controls:

Address Lets users enter a GPIB address for the 360B. The GPIB address can also be entered from the 360B VNA module. Whether entered from this panel or from the Initialize panel in the 360B driver, the address must be the same in both places.

Cal Sweep Type Lets users choose the calibration type: Normal (501 points), CW (1 point), N-Discrete, or Time Domain.

Normal (501) This is the normal calibration mode. It calibrates the measurement at 501 data points.

C.W. (1) The C.W. (continuous wave) position calibrates the measurement at one frequency.

N-Discrete This position lets users select the number of frequencies at which they wish calibration data taken.

Time Domain This position select the time domain function.

Debug Flag: (Secondary Function) Controls the Debug Function. This function is discussed in Section 2.

Off: Debug Function is off.

On: All appropriate W360B errors will be returned, refer to page 2-8.

VNA Model: (Secondary Function) Lets users select Model 360 or Model 360B, depending on which model they will be using.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details
ADD%	Integer	VNA Address.	
SWEEP TYPE%	Integer	VNA calibration sweep type	1 = Normal (501 pts) - step sweep 2 = CW Sweep (1 pt) 3 = N-Discrete sweep 4 = Time Domain (Harmonic) sweep

Output Parameters: None.

Error: LabWindows error codes(220-300). W360B error codes.

Program Examples:

QuickBASIC:

```
REM Assign GPIB address.
d..ret# = W360BCAL.startcal (ADD%, SWEEP TYPE%)
```

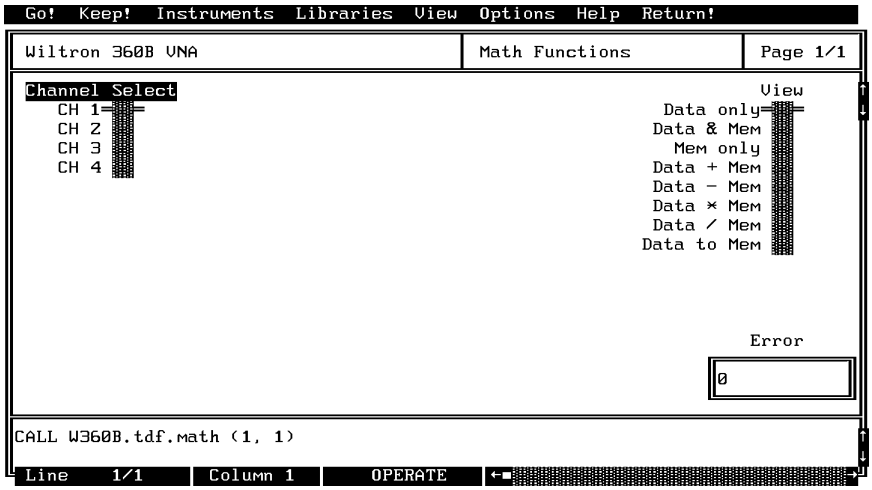
Microsoft C:

```
/* Assign GPIB address. */
d_ret = W360BCAL_startcal (ADD,SWEEP TYPE)
```

tdf.math

Function Panel Name: Math Functions

Description: This function lets users perform the basic trace math and memory function available with the 360B.



Controls:

Channel Select: Lets users select the active channel to which math will be applied: 1 through 4.

View:

Data Only: Displays the measured data; that is, the data presently being taken.

Data & Mem: Displays measured data superimposed over stored memory data.

Mem Only: Displays the stored data; that is, the data that was previously taken. (See Data to Memory function panel-`tdf.mem`).

Data + Mem: Displays measured data added to stored data.

Data – Mem Displays measured subtracted from stored data.

Data x Mem: Displays measured data multiplied by stored data.

Data / Mem: Displays measured data divided by stored data.

Data to Mem: Stores the measured data to internal memory.

Input Parameters: (D) is the default setting.

Variable Name	Variable Type	Description	Details	Range
CHSEL%	Integer	Channel select MEM channel	1 = Channel 1 (D) 2 = Channel 2 3 = Channel 3 4 = Channel 4	
FUNC%	Integer	View function	1 = Data only 2 = Data & Mem 3 = Mem only 4 = Data + Mem 5 = Data – Mem 6 = Data * Mem 7 = Data / Mem 8 = Data to Mem	

Output Parameters: None.

Error: LabWindows error codes(220-300). W360 error codes.

Program Examples:

Quick BASIC:

```
REM Trace math.
CALL W360B.tdf.math(CHSEL%,FUNC%)
```

Microsoft C:

```
/* Trace math. */
W360B_tdf_math(CHSEL,FUNC)
```