

# TM 5000 TEST PROGRAM GENERATOR 4105 VERSION

## Software Users Manual

### Preface

The TM 5000 Test Program Generator (TPG) lets you easily set up TM 5000 test systems. With this software, you can interactively program the 4041 Controller to both run tests on your system and log test results. TM 5000 TPG is easy to use, and with it you do not need to know how to program in BASIC to create sophisticated test procedures.

A general description of the TPG is discussed in the first section of this manual. Included you will find an overview of the features of the program.

Section 2 will help you get started using the program. Here you will find information about loading the software, setting up your terminal to work with the TPG, and setting up the General Purpose Interface Bus (GPIB).

Creation of test procedures used for controlling your system is discussed in Section 3. Features of the TPG are presented in detail in this part of the manual. Also included are some hints on how to check out test procedures during the development process, as well as how to avoid pitfalls while using the TPG.

Detailed information about the option selection menus displayed in the program will be found in Section 4. In-depth information about the options contained in each menu is described in this final part of the manual.

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## SECTION 1

### SPECIFICATIONS

#### Equipment Required

##### Controller

4041 Opt 23, 30 (160K Memory and Program Development ROMs)  
Ver. 2.0 Firmware  
Opt. 01 and Graphic ROMs R01 and R02 recommended

##### Terminal

4105

##### Peripherals

Any RS-232C Line Printer (4643 recommended):  
4041 Opt. 01 is needed to use the printer

##### Storage Media

4041 Magnetic Tape

##### Instrumentation

At least one instrument must be powered-up and attached to the 4041 GPIB port.

#### Purpose

To create automated test procedures and execute them. Instrumentation must be on the GPIB to create test procedures.

#### User Knowledge Needed

Procedure creation -- Knowledge of electronics test procedures, ability to use instruments manually. Familiarity with general automated test criteria (e.g., device under test settling times and test instrumentation throughput restrictions). Ability to follow written instructions. No software skills required.

Procedure execution -- Ability to follow written instructions. No software skills required.

## TEST STEPS

### Type of Test Steps

OPERATOR PROMPT -- Print a message to the terminal containing instructions for the operator. The operator may enter numeric data or use PASS/FAIL keys.

SETUP -- Acquire device settings via Tektronix Codes and Formats SET? query or via user input through terminal keyboard. A PAUSE interval for settling is programmable.

DATA ACQUISITION -- Acquire single numeric value from instrument or terminal keyboard. A PAUSE interval for settling is programmable.

LOOP -- Increment or decrement the numeric argument portion of an instrument command. Argument value may be altered as a linear or logarithmic function. Alternatively, send the same single device message at each iteration. Acquire data at each iteration, see DATA ACQUISITION above.

### Number of Test Steps

Maximum of 100 single steps with no loop steps

Maximum of 10 loop steps

Maximum number of single steps =  $100 - (3 \times \text{number of loop steps})$

e.g., 70 single steps with 10 loop steps

### Editing Functions (Procedure Creation)

List all procedure steps

Delete step

Replace step

Insert step

### Test Execution Modes

RUN -- Sequentially execute all test steps.

STEP -- Sequence through each test step by pressing a function key.

OPERATOR INTERACTIVE -- If acquired data fails a limit test, user chooses from menu of CONTINUE, REPEAT STEP, AVERAGE (repeat n times and average the result), ABORT TEST.

ABORT -- Press 4041 ABORT key to terminate test execution.

## Documentation

List to terminal or COM1 RS-232C port --

Test Procedure Steps and Limits

Test Procedure Acquired Data and Limits Table

List to 4041 thermal printer --

Test Procedure Acquired Data and Limits Table

Test Procedure data file name and required instruments  
by port and primary address.

List to 4041 magnetic tape file --

Test Procedure Steps, Limits, and Configuration Table

Test procedure Acquired Data and Limits Table

## Applications

An automated test procedure, which can be created with this software, has the ability to control signal source, signal switching, and measurement instruments. Measurement data is acquired during the test procedure and compiled in a table for data logging. Thus, the procedure is essentially a programmable test and measurement data-logging system.

Measurement data can be acquired from: DM 5010, DC 5010, DC 5009, CG 5001, AA 5001, PS 5004, and cards in the MI 5010 and MX 5010 extender. The acquired data can be compared to user-entered limits. The result is a PASS or FAIL notation in the data log table.

The data log table that results from the test procedure is displayed on the terminal. The user has the choice of printing the table on an RS-232C-compatible printer (if the 4041 is equipped with Opt. 01) or storing the data table on a 4041 tape file. Data stored on the tape can be retrieved for later analysis.

The following stimulus or signal switching instruments are supported: FG 5010, PS 5004, PS 5010, CG 5001, SG 5010, SI 5010, and cards in the MI 5010 and MX 5010 extender.

### Limitations

FLOW -- The primary limitation in capability has to do with the sequential flow of test steps in the procedure. Branching to a particular test step based on test data results is not supported. Procedure execution begins with the first step only and must continue through the last step in order to log the test data. If the procedure is terminated with the ABORT key, the data will be lost.

DATA -- Other than the limits comparison function, no data manipulation or reduction is performed. Waveforms and data arrays cannot be acquired or logged.

NUMBER of STEPS -- Large procedures in excess of 100 steps may be created with this software if the procedure is broken up into manageable blocks. Each block can then be loaded and run as a separate procedure.



## SECTION 2

### GETTING STARTED

This section gets you started with a detailed description of the setup process.

#### Minimum Hardware Requirements

4041 Controller (Version 2.0 or later firmware is required)

Option 01 (second GPIB and RS-232C ports) required for data and procedure output to an external printer and/or modem.

Option 23 (160K total memory)

Option 30 (Program Development ROMs required to load ASCII programs)

#### 4105 Color Graphics Terminal

At least one of the following instruments must be active on the GPIB for procedure generation.

AA 5001	DM 5010	PS 5004
CG 5001	FG 5010	PS 5010
DC 5009	SG 5010	MI 5010
DC 5010	SI 5010	

#### 4105 Display Terminal Setup

The software will setup all of the 4105 operating parameters except baud rate. The operator must pre-set the baud rate to establish communication between the 4041 Controller and the 4105 terminal.

1. Make sure the 4105 power is on and wait for a visible cursor to appear on the screen.

2. Now set the baud rate to 9600 (maximum rate for the 4041 Controller) by pressing the SETUP key followed by the characters BAU, space, and 9600. The 4105 SETUP key must be pressed again to exit the SETUP mode and permit operations with the 4041 Controller. The 4105 prompt character is the "\*" character. This character will be seen at the left margin with the active underscore cursor next to it. The line will look as follows (**bold face** characters entered by operator):

```
* BAUD 9600<cr>
*
```

Note: 9600 is a recommended baud rate for optimizing 4041 to 4105 data transfer. Baud rate selections are limited to valid 4041 and 4105 rates.

#### 4041 Controller Setup

The 4041 Controller requires little attention and virtually no setup.

Two steps and the 4041 is ready to go:

1. Connect the 4105 RS-232C Interface cable to the 4041 RS-232C port marked COMMO. COMMO is the standard RS-232C port. If your 4041 includes Option 1 (additional GPIB and RS-232C ports) you can connect COMM1 to an external printer.

2. Turn on the 4041 power.

Details on how, when and what to connect to the 4041 Controller's GPIB port are described under **GPIB Initialization Process**.

Note: If a DC-100 tape cartridge is installed during the power-up cycle, the AUTOLD file which contains the TM 5000 TPG program will load automatically.

## Loading the Software

The entire TM 5000 TPG program resides in a single file on the DC-100 tape cartridge. You need be concerned only about "loading" the file named AUTOLD.

To load the AUTOLD file, insert the DC-100 tape cartridge and press the 4041 Controller's front panel AUTO LOAD button.

The loading process takes several minutes.

Note: As we mentioned, this step could be eliminated by inserting the TM 5000 TPG Software tape cartridge into the 4041 Controller prior to turning the power on. The 4041 automatically loads an AUTOLD file at power on.

## What You Need to Know About the GPIB

Most of the "systemizing" process is handled by the TM 5000 TPG program. However, you need to observe the following GPIB configuration limitations as they are defined by the IEEE-488 1978 specifications.

1. A maximum of 14 GPIB devices can be connected to a single GPIB port. If you have Option 1 installed in your 4041, you can have up to 28 GPIB devices in your system, 14 at each port.
2. Each GPIB device on a given port must have a unique address within the range of 0 and 30. However, for this system, address 30 must be reserved for the 4041 Controller. Make sure you don't use this address for any other device.
3. A minimum of two-thirds of all of the GPIB devices connected to the GPIB must be active to insure proper data transfer. We recommend that you physically remove all inactive devices from the GPIB.
4. A minimum of one GPIB device must be active on the GPIB per two meters of cable.

## Linking the 4041 Controller to the 4105 Color Graphics Terminal

When the TM 5000 TPG program has completed the loading process, a message will appear on the 4041 front-panel display indicating that the TM 5000 TPG software is ready to go. This message will be displayed for approximately five seconds and then be replaced with a prompt requesting the terminal's baud rate.

Enter the 4105's baud rate using the 4041 front-panel keys. Press the PROCEED key to continue.

-- If you enter a wrong value and you realize the mistake prior to pressing the PROCEED key, press the CLEAR key and re-enter the number.

-- If you have entered an invalid 4041 baud rate, an error message will be displayed on the 4041 front panel. You will then be prompted to re-enter the baud rate.

When the 4041 is satisfied with baud rate entry, the 4105 will become the system console.

-- If the 4041's baud rate matches the 4105's baud rate you're in business and you're ready for the next step.

-- If baud rates do not match, you will see gibberish displayed on the 4105 screen. When this occurs, press the 4041 ABORT key; "console" is passed back to the 4041 front panel and you have another opportunity to enter the appropriate baud rate.

Note: "Console" refers to the part of the computer system used for communication between the operator and the computer. (i.e., 4041 Controller front panel or display terminal keyboard. The 4041 development keyboard is part of the front panel.)

## Setting the 4041 Calendar/Clock

Once proper communication has been made between the 4041 and the 4105, you will be prompted to set the 4041's Calendar/Clock.

-- Enter the data in the same format that is displayed on the CRT (day-month-year hour:minutes:seconds). Entering the "seconds" parameter is optional. The hour is entered in 24-hour format (e.g., 2:00 PM is 14:00 hours).

-- Again, if you make a mistake, you will be allowed to re-enter the data.

Note: If the Calendar/Clock was set prior to loading the TM 5000 TPG Software, this step will be omitted.

### **GPIB Initialization Process**

You will be prompted to connect and activate instruments on the GPIB port(s). This gives you an opportunity to configure the bus appropriately prior to the GPIB initialization process.

Initializing the GPIB is the first and probably the most crucial step in the procedure development process, not because it is difficult, but because the rules are rigid. Non-compliance with these rules can cause disappointment and frustration the next time you execute your procedure from tape (details in **Inputting Procedure from Tape**).

1. All the rules outlined in **What You Need to Know About the GPIB** apply.
2. All GPIB devices active on the bus during the GPIB initialization process will be required to be connected to the same GPIB port and set to the same addresses during test execution whether actually used or not.
3. Remove all GPIB devices from the bus which are not required for this procedure.

When you're satisfied with your configuration, press the 4105 RETURN key and a list of active GPIB instruments will be displayed on the CRT. If GPIB1 (optional GPIB port) is not a part of your system, a message will indicate this.

Press the 4105 RETURN key again and you're ready to develop a procedure.



## SECTION 3

### TEST PROCEDURE GENERATION AND EXECUTION

#### Preparation

Generating a test procedure is a simple task with the TM 5000 TPG if you understand your application and if you have the appropriate instruments in your system.

Things to keep in mind when you're generating a procedure are:

1. Know the test procedure you wish to produce. Have a manual procedure document to work from which lists specifications. Work out the order in which instruments must be set up before attempting to produce a TM 5000 TPG procedure at the keyboard. A test step in the wrong place cannot be renumbered, but must instead be deleted and re-entered (or inserted) at a different point in the procedure.
2. A test is limited to 100 procedure steps. Steps are defined as either NO MEASUREMENT (instrument setup with specified delay), MEASUREMENT (step can include instrument setup, specified delay, specified limits, and data logging, labeling information), or OPERATOR PROMPTS which can include MEASUREMENT characteristics via keyboard input.
3. Editing can occur after the completion of any procedure step. If you make an error, you can fix it.
4. The test procedure can be executed at any point in the development process by selecting the EXECUTE PROCEDURE key from the Main Menu.
5. Store your procedure on tape before retrieving another one.
6. Understand individual instrument capabilities.

Most procedures will consist of several types of steps. Usually the first step would be to prompt the operator for cable connections and switch setups. Then continuity tests might be made. Power supply voltages and currents must be set up and then stimulus signals must be switched to the device under test and output signals switched to the acquisition instruments. At that point, measurements may be made with the system.

## Screen Layout and Menus

The menus presented by the TM 5000 TPG permit you to either produce a new procedure and run it, load a procedure, alter it and execute it, or just load a completed procedure and execute it. The system user-definable keys are used to select items from the current menu. The terminal screen is divided into two parts; a Status Field (blue) in the top quarter of the screen, and the Work Space (brown) in the bottom three quarters of the screen for user text input to the computer. The menu keys are presented and labeled in the Status Field and are layed out just as they are seen on the terminal keyboard. The Status Field is a protected field and is not accessible to the user.

## Main Menu and Step Auto Numbering

The Main Menu permits you to produce new procedures or alter old ones retrieved from the tape. When using the Main Menu to produce a procedure, the step number is automatically generated (starting at 1, ending at 100) and displayed in the upper right corner of the Status Field. This portion of the screen is a protected field reserved for status information about the step number and the menu key currently invoked. The number displayed will always be the current step being generated or the next step to be generated. To produce a step prior to the step number displayed, you must insert a step using the Edit Menu keys. The Edit Menu is available via the Main Menu.

## Edit Menu

The Edit Menu provides an opportunity to list, insert, delete, or replace steps. If an error was made in producing a step, the whole step must be replaced in order to fix the error. Inserting or deleting steps causes the whole procedure to be renumbered. The current step being edited will be displayed in the Status Field. Upon exiting the Edit Menu, the new current step (next to be generated) will reflect the renumbering caused by the editing.



## **Execution Menu**

Use the EXECUTE PROCEDURE key to leave the Main Menu and enter the Test Execution Menu in order to execute a procedure. The Test Execution Menu permits you to load other procedures from tape without going back to the Main Menu. A procedure may be run at any time while it is being produced, thereby permitting you to immediately verify that your testing method works properly. By using the STEP TEST key at execution time, you may step your test procedure and watch the system perform at a rate which allows you to catch any procedural or timing (settling) problems.

## **Front-Panel Lockout**

All instruments in the system will be placed in the Remote-With-Lockout State when a procedure is executing. This means that instrument front panels will be locked out to prevent operator tampering while the procedure is executing. The only exception to this is when a step has been programmed to place a particular instrument in the Local-With-Lockout State by use of the UNLOCK PANEL key during step generation. At this point the operator may be permitted to alter front-panel settings for the selected instrument.

All instruments are in the Local State (front panels not locked out) while generating procedure steps and after a procedure has executed and terminated.

## **Storing Procedures**

Once you are satisfied that your procedure is correct, you may go to the Main Menu and store the procedure on tape using the STORE >TAPE key. This may be done at any time during the creation process and does not alter the procedure in memory. When creating a long procedure, it is advisable to store frequently. This will save you a great deal of time and anguish in the event that a colleague trips over the power cord and unplugs your system or some other such catastrophe occurs (leave it to Murphy!). This is called "backing up".



## SECTION 4

### MENU KEY DEFINITIONS

#### Main Menu

This section gives a brief description of the user key functions. For specific details on program flow, refer to flow diagrams in the Appendices.

OPERATOR PROMPT -- allows you to generate a procedure step which permits multi-line prompting (up to 300 characters). At entry time, each line can be delimited with the carriage return <CR> key. The TAB key will cause a tab character to be inserted which causes the terminal to tab to the next tab stop. Tab stops are set at fixed columns as follows: 1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 80. The entire prompt can be ended with the linefeed <LF> key.

An operator prompt can be a simple setup/connect message to the operator, an interactive prompt requiring manual data entry or pass/fail information, or any combination thereof. The interactive conditions are defined by your response to questions during creation of a step.

This key function is also available from the Select Instrument Menu.

SELECT INSTRUMENT -- redefines the keys for instrument selection (see Select Instrument Menu).

MEASUREMENT LOOP -- generates two rigidly defined procedure steps which allow you to select a stimulus/measurement instrument combination for iterative measurement acquisition (100 measurements maximum/loop).

Upon selection of the MEASUREMENT LOOP key, the program branches to the Select Instrument Menu and prompts you to select a stimulus instrument. Additional prompting allows you to select linear or logarithmic incrementing for a stimulus parameter or to simply send the same device-dependent message for each iteration of the loop.

After completion of the stimulus instrument step, you will be prompted to select a measurement instrument. In this step, all of the "normal" setup functions for measurement instruments prevail (see Instrument Operating Mode Menu).

Note: When calculating steps required for each procedure, add one step of overhead for each MEASUREMENT LOOP step sequence. If your procedure includes three MEASUREMENT LOOPS, calculate the total steps used as number of loop steps times three. Three MEASUREMENT LOOPS would use nine of the available 100 steps.

There are a maximum of ten MEASUREMENT LOOPS permitted per test procedure and each loop is limited to 100 iterations.

EDIT PROCEDURE -- redefines the keys for editing (see Edit Menu).

FROM TAPE -- allows you to retrieve a previously developed procedure from tape. The file must contain data developed by the TM 5000 TPG.

All instruments active during procedure development must be active on the same port and at the same address before the procedure will run.

Inputting a procedure from tape will replace the procedure currently in memory.

Note: Several error handlers for tape I/O will prompt the user if there is a problem with the file being retrieved.

STORE >TAPE -- stores the current procedure on a user specified tape file.

Note: Several error handlers are defined for tape I/O.

GENERATE NEW PROCEDURE -- causes the program to clear the current procedure from memory and reconfigures the GPIB.

The program will prompt you to find out if you're sure that you want to destroy the procedure currently in memory.

TERMINATE PROGRAM -- permits you to terminate the TM 5000 TPG program and return to "Immediate Mode" if your 4041 Controller has the Program Development ROM installed. To restart the TM 5000 TPG program, you must type RUN on the terminal keyboard.

The program will prompt you to find out if you really intended to terminate the program.

HELP -- retrieves Main Menu help information from a tape file and displays the information on the 4105 CRT. If your 4041 has the optional RS-232C Data Comm port (COMM1) installed, you can list this information to an external printer.

The HELP information is retrieved from a data file, therefore the appropriate tape (TM 5000 TPG Software) must be installed in the tape drive. If the files are not available, no data will be displayed and the operator may continue on as before.

EXECUTE PROCEDURE -- allows you to execute a TM 5000 TPG developed procedure. This procedure can be either a procedure currently in memory or one retrieved from tape.

Retrieving a procedure from tape will replace the procedure currently in memory.

#### Select Instrument Menu

The Select Instrument Menu keys provide the means for selecting any one of the instruments supported by the TM 5000 TPG program.

Returning to the Main Menu prior to selecting any other key in this menu cancels the step.

When an instrument is selected and there is only one instrument of its model type active on the GPIB, the program will immediately branch to the selected instrument's Instrument Operating Mode Menu.

Selecting an instrument not currently active in your system will generate a message telling you to select another instrument.

If there is more than one of any given model type active, a list of all of those active (same model) will be displayed along with the addresses and port to which they are connected. Select the instrument intended for the current step.

Remember that all GPIB devices must have a unique address on a given port.

DC 5009 -- selects the DC 5009 Programmable Universal Counter/Timer.

DC 5010 -- selects the DC 5010 Programmable Universal Counter/Timer.

DM 5010 -- selects the DM 5010 Programmable Digital Multimeter.

FG 5010 -- selects the FG 5010 Programmable 20 MHz Function Generator.

PS 5010 -- selects the PS 5010 Programmable Triple Power Supply.

MI 5010 -- selects the MI 5010 Multifunction Interface System including any cards active within the MI 5010.

SI 5010 -- selects the SI 5010 Programmable Scanner.

AA 5001 -- selects the AA 5001 Programmable Distortion Analyzer.

SG 5010 -- selects the SG 5010 Programmable Oscillator.

CG 5001 -- selects the CG 5001 Programmable Calibration Generator.

PS 5004 -- selects the PS 5004 Programmable Precision Power Supply.

OPERATOR PROMPT -- (see Main Menu definitions).

HELP -- copies Select Instrument Menu key definitions from a tape file and displays the information on the terminal CRT. If your 4041 Controller has the optional RS-232C Data Comm port (COMM1) installed, you can list this information to an external printer.

MAIN (EDIT) MENU -- returns program control to the Main Menu or to the Edit Menu if a step is being edited.

The appropriate menu definition will be displayed.

#### **Instrument Operating Mode Menu**

When an instrument is selected, the Instrument Operating Mode Menu will be made available to permit use of specific instrument functions. The Instrument Operating Mode Menu varies depending on the instrument functionality.

Operation functions are classified as follows:

1. **Stimulus only** instruments (FG 5010, PS 5010, SG 5010, and SI 5010) are signal sources and switchers which cannot be programmed to acquire measurement data.
2. **Measurement only** instruments (AA 5001, DC 5009, DC 5010, and DM 5010) are acquisition devices which have no programmable output signals.
3. **Stimulus/measurement** instruments (PS 5004, CG 5001, and MI 5010) can be used to generate signals and acquire measurement data.

**LEARN SETTINGS** -- prompts you to setup the selected instrument's front panel. Either press its front panel INST ID button or user key 1 again to cause the program to learn those settings. The learned settings are displayed on the CRT. If an error has been made and the settings are not correct, you may make the appropriate front-panel settings change and press this key again. The new settings will be learned and displayed and the old settings will be discarded. This will always be possible as long as the step has not been completed using the Select Instrument or Main Menu keys.

**KEYBOARD INPUT** -- allows you to enter instrument commands via the terminal keyboard. When an entry is complete (terminated with a carriage return) the commands are sent to the selected instrument after the learned settings commands are sent (if any were learned). If any command/argument errors are reported by the instrument, a message will be displayed on the CRT and you will have the opportunity to re-enter the commands. This key may be used as many times as necessary until you are satisfied with the instrument setup and measurement as viewed on the front panel. Using this key does not alter the learned settings acquired with the LEARN SETTINGS key. However, any settings you enter may override the learned settings. These two keys, LEARN SETTINGS and KEYBOARD INPUT, work together to allow you to both learn front-panel settings and add to those settings via the terminal keyboard. If this key is pressed accidentally and you do not wish to enter keyboard settings, merely press the RETURN key and enter no settings.

When the commands are received without errors, they are appended to any previously learned settings for this step.

Total allowable length of a command string is 300 characters. This includes combinations of LEARNED SETTINGS and KEYBOARD INPUT.

Pay close attention to the prompting associated with this key and keep your instrument Reference Guides handy.

The KEYBOARD INPUT function is useful in a variety of ways:

1. It provides programmability for non front-panel functions (see instrument Reference Guides).
2. It lets you program only those instrument setup changes which differ from a previous step (TM 5000 TPG procedures are **always** executed sequentially from step 1 to completion).
3. It is the only way to program the MI 5010 and SI 5010 for something other than their initialized conditions.

SET DELAY -- permits you to specify delays during test execution. The delay will be executed after an instrument's setup in a non-measurement step and prior to measurement acquisition in a measurement step.

UNLOCK PANEL -- specifies that the instrument will not have its front panel locked out as is normally the case. This permits the operator to alter front-panel settings during the procedure if necessary. The instrument panel will be locked out for subsequent steps.

MAKE MEASUREMENT -- key is valid for MEASUREMENT and STIMULUS/MEASUREMENT qualified instruments only.

It is this key that makes the distinction between whether or not the step being generated is defined as a measurement vs. non-measurement step.

If the instrument you have selected is a DC 5009 or DC 5010, you can define the step to be a standard counter function measurement or a peak-to-peak measurement. If a peak-to-peak measurement is specified, the software automatically determines the input coupling and attenuation required to obtain the most accurate measurement of peak-to-peak within the trigger level range of the counter.

If a CG 5001 Scope Cal Generator is selected, the measurement will consist of the PCT readout and the U/D readout. The operator will be prompted to press the CG 5001 CONTINUE button after having adjusted the VAR knob. This will complete the measurement. The PCT measurement will be compared to limits if any are specified. The U/D value will be automatically used for UNITS information on the test data results printout.



Pass/fail limits can also be specified for data acquisition comparisons during test execution. Pass/fail limits are not permitted within a MEASUREMENT LOOP step.

You will also be prompted for measurement label and units label.

After all of the prompting has been satisfied, the program will automatically return to the Select Instrument Menu, thus terminating the step.

SELECT INSTRUMENT -- returns user key control to the Select Instrument Menu and terminates the step.

MAIN (EDIT) MENU -- returns program control to the Main Menu, or to the Edit Menu if you are editing a step, and terminates the step.

#### Edit Menu

The Edit Menu is available via the Main Menu only.

Edit functions include:

LIST STEPS -- lists all procedure steps currently in memory.

You can also list the procedure to a printer or other device if the 4041 Controller has the optional Data Comm port installed. Physical and logical Comm parameters can be set when prompted by the program.

The values to use for COMM1 physical and logical parameters depend on the type of printer used and its setup. For further information on COMM parameters, see Appendix D of the 4041 Programmer's Reference. See your printer's manual for information about its communications requirements.

DELETE STEP -- allows you to delete one step at a time.

Subsequent procedure steps are renumbered.

REPLACE STEP -- allows you to replace an existing step. The Select Instrument Menu is displayed for step generation (see Select Instrument Menu and MEASUREMENT LOOP functions for details).

If a MEASUREMENT LOOP replaces a single step, all subsequent steps will be renumbered accordingly (measurement loops require two steps).

See Note (Edit) at the end of the Edit Menu descriptions.

INSERT STEP -- allows you to designate a step between two existing steps and then branch to the Select Instrument Menu for step generation (see Select Instrument Menu and MEASUREMENT LOOP functions for details).

Upon completion of the new step (TM 5000 TPG generates two steps if MEASUREMENT LOOP was created), you will need to return to the Edit Menu to complete the editing process.

All steps after the inserted step(s) are renumbered.

See Note (Edit) at the end of the Edit Menu descriptions.

HELP -- copies Edit Menu key definitions from a tape file and displays the information on the terminal CRT.

If your 4041 controller has the optional RS-232C Data Comm port (COMM1) installed, you can list this HELP information to an external printer.

MAIN MENU -- returns program control to the Main Menu.

Keys 5-8 and 11-20 are undefined in this menu.

Note (Edit): Steps 96-100 cannot be inserted or replaced. Instead, the step "in error" and all remaining steps must be deleted with the DELETE STEP key. The new step and subsequent steps must be generated via the Main Menu keys.

### **Test Execution Menu**

The Test Execution capability resides within the TM 5000 TPG program and is accessed by selecting key 10 from the Main Menu.

Upon entering the Test Execution environment, you will be asked to respond to four prompts which set up the test parameters (see SETUP TEST key definition).

To execute the test procedure, you must press the RUN TEST function key.

The Test Execution key definitions are:

SETUP TEST -- lets you select whether you want to execute the procedure currently in memory or select one from tape. Selecting a procedure from tape will destroy a procedure currently in memory.

You will be prompted for:

Operator Name  
Test Device ID Name or Number  
Operator Interactive Testing (Y/N)

The operator name and device ID prompts give the operator the opportunity to enter "identification" information used for data logging.

Choosing to run with operator interaction allows you to take some alternative actions if a measurement fails when it is compared to pre-defined limits (limits are set during the development process). See Test Failure Prompting Menu for choices.

RUN TEST -- causes the TM 5000 TPG to begin test execution. All tests are executed sequentially.

STEP TEST -- causes the TM 5000 TPG to begin test execution in STEP mode. STEP mode causes the procedure to be executed one step at a time. Measurement loops are executed as "one" step. You will be prompted to press STEP TEST to execute each step.

The STEP mode is particularly helpful when checking the correctness of a test procedure.

PLOT LOOPS -- presents a menu of all loop tests which have been run and permits you to choose one to be plotted on the terminal screen. The acquired data is plotted on the horizontal axis and the stimulus parameter is plotted on the vertical axis. If no stimulus was specified, the increment number is plotted instead. The menu of loop tests is always present until you choose to return to the Test Execution Menu by entering a 0 in response to the menu prompting.

HELP -- retrieves Test Execution Menu help information from a tape file and displays the information on the terminal CRT.

If your 4041 has the optional RS-232C Data Comm port (COMM1) installed, you will be permitted to list this information to an external printer if desired.

MAIN MENU -- returns program control to the Main Menu.

Keys 4-8 and 11-20 are not defined in this menu.

### Test Failure Prompting Menu

The Test Failure Prompting Menu is accessed if an acquired measurement is not within defined limits and if the procedure was set to be run with operator interaction.

Once this menu is displayed on the CRT, it will remain there until it is replaced by either the Test Execution Menu or the Pass/Fail Menu. The keys are only active when the "Press a function key" prompt appears.

CONTINUE -- allows test execution to continue with the next procedure step.

REPEAT MEASUREMENT -- allows the step that just caused a "failed" condition to be re-executed. If the test passes after re-execution, then the next procedure step will be executed. If the test fails, take appropriate action by pressing one of the Failure Prompting keys.

AVERAGE MEASUREMENT -- allows the average of (x) number of measurements to be calculated. The average will then be compared to the specified limits to determine pass/fail conditions. If the test still fails, take appropriate action by pressing one of these Failure Prompting keys.

ABORT TEST -- stops test execution and returns to the Test Execution Menu. Output results are not logged.

### **PASS/FAIL Keys**

The PASS/FAIL keys are active during steps which require operator pass/fail input.

PASS -- lets the operator indicate that a condition passed per instructions executed by an OPERATOR PROMPT step.

FAIL -- lets the operator indicate that a condition failed per instructions executed by an Operator Prompt step.

