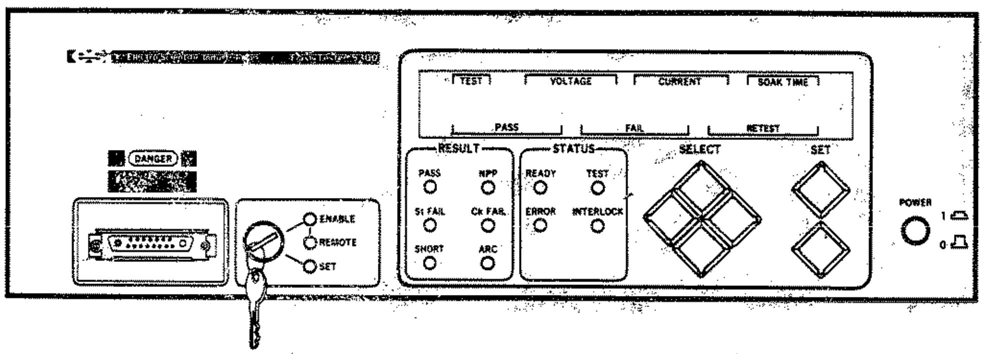
MODEL 5300

Flash Tester

Instruction Manual

Part Number 59180C October 1987



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SECTION S
SAFETY INFORMATION

S.1 INTRODUCTION

Read and follow the DANGERS, WARNINGS, and CAUTIONS in this manual. They are designed to emphasize safety during all phases of operation and maintenance.

S.2 SAFETY TERMS AND MEANINGS

CAUTION -- Identifies conditions or practices that could result in damage to the equipment or property or may result in improper operation of the equipment.

WARNING -- Identified conditions or practices that could result in severe personal injury or loss of life. In addition, damage to the equipment or other property may result.

DANGER -- These usually correspond to labels apppearing on the equipment.

On the equipment they indicate a hazard to personnel that could result in serious injury or loss of life is nearby.

In the manual they identify a procedure or function that exposes the user to a critically hazardous area.

S.3 WARNINGS APPEARING IN THIS MANUAL

DANGER

THE FOLLOWING STEP PLACES A POTENTIALLY LETHAL VOLTAGE ON ONE SIDE OF THE DUT. THE DECADE RESISTOR AND AMMETER ARE CONNECTED TO THIS VOLTAGE. EXTREME CAUTION MUST BE FOLLOWED TO VERIFY THAT THE PROPER TEST CONDITIONS HAVE BEEN SELECTED AND THAT CONTACT WITH THE AMMETER OR DECADE RESISTOR WILL NOT OCCUR. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

DANGER

IF THE ZERO VOLTS FAILURE MESSAGE IS DISPLAYED, THE DUT MAY BE CHARGED TO A LETHAL VOLTAGE. EXTREME CARE MUST BE TAKEN TO DISCHARGE THE DUT SAFELY. CONTACT WITH THE DUT LEADS COULD CAUSE SEVERE INJURY AND/OR DEATH.

DANGER

BEFORE BEGINNING THE FOLLOWING PROCEDURE, VERIFY THAT THE INSTRUMENT LINE CORD HAS BEEN REMOVED FROM THE INSTRUMENT. FAILURE TO DO SO MAY EXPOSE POTENTIALLY LETHAL HIGH VOLTAGE. FAILURE TO REMOVE THE LINE CORD MAY RESULT IN SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

DANGER

THE BLANK PANEL MUST BE INSTALLED IN THE UNUSED LOCATION TO PREVENT ACCESS TO THE INTERNAL CIRCUITRY OF THE INSTRUMENT. FAILURE TO INSTALL THIS PLATE COULD RESULT IN SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

DANGER

FAILURE TO PROPERLY INSTALL AND TEST THE INTERLOCK SYSTEM MAY RESULT IN SEVERE INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE. EXTREME CARE MUST BE FOLLOWED TO ENSURE THAT THE INSTALLATION INSTRUCTIONS ARE FOLLOWED CORRECTLY.

DANGER

DO NOT ATTEMPT TO OPERATE THE INSTRUMENT UNTIL THIS INTERLOCK TEST HAS BEEN SUCCESSFULLY PERFORMED. FAILURE TO DO SO CAN RESULT IN SEVERE INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

DANGER

IF THE STATUS OF THE INTERLOCK LED IS OTHER THAN EXPECTED IN THE FOLLOWING STEPS, TURN THE POWER SWITCH OFF IMMEDIATELY, REMOVE THE POWER CORD, AND RECHECK THE WIRING OF THE INTERLOCK SWITCHES. FAILURE TO DO SO CAN RESULT IN SEVERE INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

WARNING

THE SYSTEM MUST HAVE ADEQUATE COVERS TO SHIELD THE OPERATOR FROM THE TEST HEAD PROBES WHILE TESTING IS TAKING PLACE. THESE COVERS MUST BE CONNECTED TO THE INTERLOCK SYSTEM. NO TESTING SHOULD BE PERFORMED UNTIL PROPER OPERATION OF THE INTERLOCK SYSTEM HAS BEEN VERIFIED. FAILURE TO DO SO CAN CAUSE SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

WARNING

BEFORE CLEANING THE EXTERIOR OF THE INSTRUMENT, UNPLUG THE POWER CORD FROM THE INSTRUMENT. FAILURE TO DO SO CAN CAUSE SERIOUS INJURY IF CLEANING SOLVENT IS ALLOWED TO ENTER THE INSTRUMENT.

WARNING

DO NOT ATTEMPT TO LENGTHEN THE TEST CABLE ASSEMBLY. LENGTHENING THE COAXIAL CABLES CAN PRODUCE A SERIOUS HAZARD THAT MAY EXPOSE THE USER TO POTENTIALLY LETHAL VOLTAGES. THIS HAZARD CAN CAUSE SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE. CONTACT ESI IF A LONGER CABLE IS NEEDED.

WARNING

IT IS ESSENTIAL THAT THE LOW VOLTAGE SHOCK SHIELD IS REPLACED AS DESCRIBED IN THE PRECEDING STEP. FAILURE TO REPLACE THIS SHIELD CAN RESULT IN A HAZARDOUS CONDIITON WHEN THE TOP COVER IS NOT IN PLACE.

WARNING

FAILURE TO FOLLOW THESE RULES CAN RESULT IN A HAZARDOUS INSTALLATION. SUCH ACTION CAN LEAD TO SERIOUS INJURY AND/OR DEATH IF CONTACT IS MADE WITH HIGH VOLTAGE.

WARNING

THE FOLLOWING PROCEDURE SHOULD NOT BE PERFORMED UNLESS THE INTERLOCK SYSTEM HAS BEEN PROPERLY INSTALLED AND TESTED. FAILURE TO DO SO CAN EXPOSE THE USER TO POTENTIALLY LETHAL HIGH VOLTAGE. CONTACT WITH THIS HIGH VOLTAGE CAN CAUSE SERIOUS INJURY ADN/OR DEATH. REFER TO TESTING THE INTERLOCK CONNECTION, SECTION 7.4.4.3, FOR INFORMATION ON VERIFYING PROPER OPERATION OF THE INTERLOCK SYSTEM.

CAUTION

PRESSING THE "RIGHT" PUSHBUTTON IN THE FOLLOWING STEP WILL CAUSE A RESET TO BE PERFORMED. IF AN INSTALLATION RESET OR A GLOBAL RESET IS PERFORMED, A NEW CALIBRATION MUST BE PERFORMED.

CAUTION

PERFORMING THIS RESET MAY CHANGE THE STRESS AND CHECK STRAY CALIBRATION AND PRESENCE CALIBRATION VALUES. AFTER THIS RESET IS PERFORMED, THESE CALIBRATIONS MUST BE PERFORMED FOR PROPER INSTRUMENT OPERATION.

CAUTION

PERFORMING THIS RESET MAY CHANGE THE HV CLAMP CALIBRATION, STRESS AND CHECK STRAY CALIBRATION, AND PRESENCE CALIBRATION VALUES. AFTER THIS RESET IS PERFORMED, THESE CALIBRATIONS MUST BE PERFORMED FOR PROPER INSTRUMENT OPERATION.

CAUTION

AVOID THE USE OF CHEMICAL CLEANING AGENTS WHICH MIGHT DAMAGE THE PLACTICS USED IN THIS INSTRUMENT. DO NOT APPLY ANY SOLVENT CONTAINING KETONES, ESTERS, OR HALOGENATED HYDROCARBONS. TO CLEAN, USE ONLY WATER SOLUBLE DETERGENTS, ETHYL, METHYL, OR ISOPROPYL ALCOHOL.

CAUTION

IT IS NECESSARY THAT AT LEAST 1/2 INCH OF INNER INSULATION REMAINS TO PROVIDE ADEQUATE AIR GAP BETWEEN THE SHIELD AND THE INNER CONDUCTOR. NO MORE THAN 2 INCHES OF INNER CONDUCTOR SHOULD EXTEND PAST THE END OF THE SHIELD TO MINIMIZE NOISE PICKUP. IN ADDITION, EXTREME CARE SHOULD BE FOLLOWED WHEN TRIMMING THE SHIELD TO ENSURE THAT THE INNER CONDUCTOR IS NOT CUT OR NICKED.

S.4 WARNING LABELS APPEARING ON THE INSTRUMENT

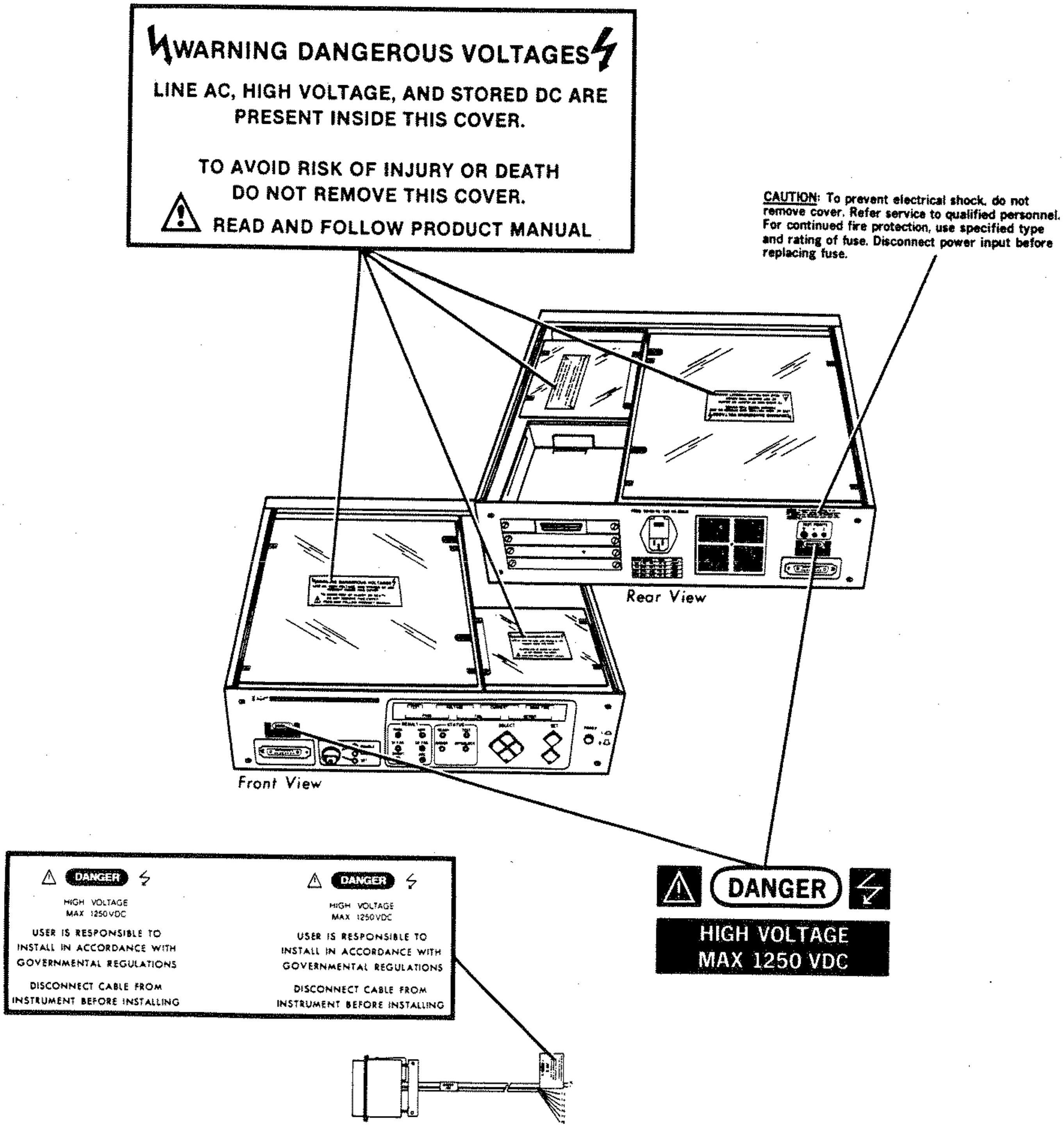


Figure S-1. Warning Label Locations

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

This is the instruction manual for the Model 5300 Flash Tester. It provides complete information about the installation, operation, performance, and maintenance of the Flash Tester.

> **NOTE:** The term "5300" will be used in place of "Model 5300 Flash Tester" throughout this manual.

1.2 FLASH TESTING

The 5300 is designed to rapidly test insulation characteristics of capacitors. This is accomplished by performing a Flash Test. Figure 1-1 provides a graphical representation of the Flash Test sequence described below.

A Flash Test has two major parts: the Stress Test and the Check Test. Both of these tests consist of the following four parts: Part Present Test, Charge, Soak, and Discharge. The Part Present Test verifies that the Device-Under-Test (DUT) is present and properly contacted. The Charge cycle charges the DUT with a constant current until the prescribed voltage is reached. This voltage is held on the DUT during the entire Soak cycle. The current through the DUT is checked at the end of the Soak cycle and compared to a preset threshold. The DUT is then discharged at the same constant-current rate as it was charged.

The Stress Test is intended to stress the DUT, causing it to fail if it is defective. Since the Discharge portion of the Stress Test could also cause the DUT to fail, it must be tested again. The Check Test is provided to allow the DUT to be tested after the Stress Test with minimal chance to damage the DUT.

During the Part Present Test, the DUT is charged at a 50 milliampere rate to 25 or 50 VDC (Check Test Voltage, 50 volts if Check Test Voltage is 0). While the DUT is being charged, the charge delivered to it is monitored, allowing the presence or absence (or poor connection) of a DUT to be determined. If the DUT fails this test, further testing is terminated.

The Charge cycle of the Stress Test is performed at a preset current, referred to as Rate. The voltage to which it is charged is referred to as the Stress Voltage. This voltage is typically much higher than the rated voltage of the DUT. It is held at this voltage for the Stress Soak Time. The leakage current limit used for the pass/fail decision is called the Stress Leakage Current. The Check Test uses the terms Check Voltage, Check Soak Time, and Check Leakage Current.

Since the Part Present Test that begins the Check Test charges the DUT to the Check Voltage, the Charge Cycle is performed as part of the Part Present Test. The Check Voltage is intended to be low enough that the DUT is not significantly stressed during the charge and discharge cycles.

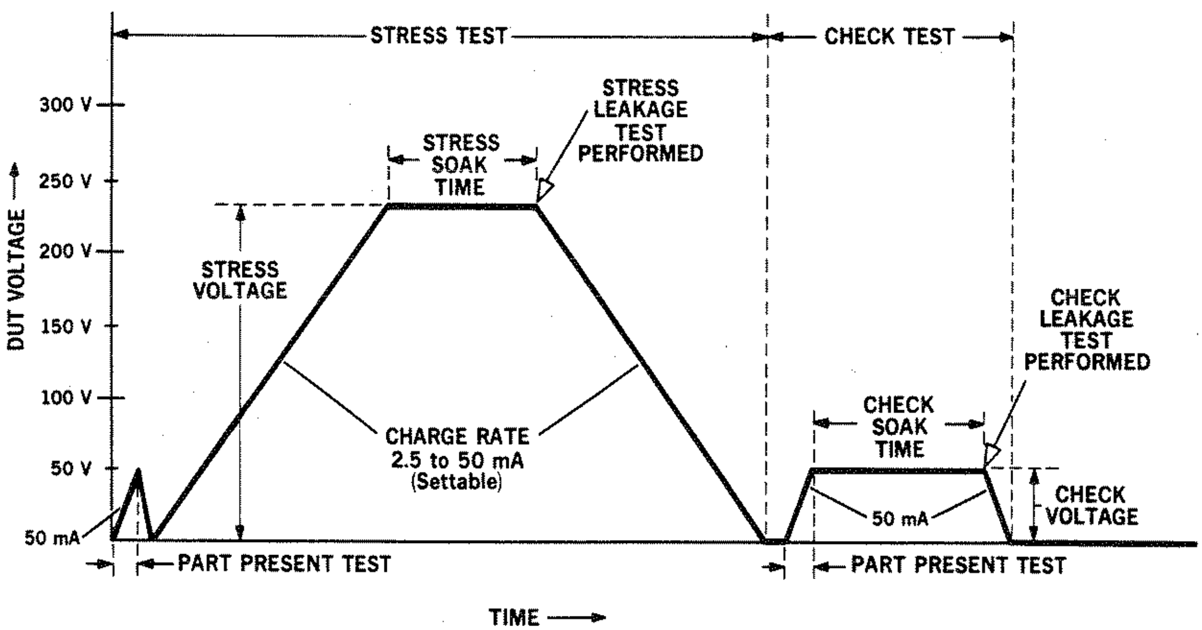


Figure 1-1. Flash Test Sequence

1.3 GENERAL DESCRIPTION

The 5300 provides most of the equipment necessary to perform Flash Testing on capacitors, one part at a time. The total test time can be less than 30 milliseconds, allowing for rapid flash testing in a production environment.

The 5300 is designed to be easy to use, yet versatile. All test conditions are set through the use of six front-panel pushbuttons, aided by a 20-character display, or through a remote device connected to a communication interface.

The 20-character display is a vacuum-fluorescent display, located on the front of the 5300. It provides the primary method for indicating operating conditions, test results, and system errors to the user.

There are three front panel modes: Enable, Set, and Configure. The Enable mode is the only front panel mode in which a Flash Test may be performed. While in the Enable mode, test conditions may be displayed but they cannot be changed through the front panel controls. The Set mode allows the test conditions to be changed through the front panel controls as well as displayed. The Configure mode allows the rarely-changed system parameters to be viewed and changed.

Access to the different front panel modes is controlled through the use of the access keyswitch on the front panel. The Set and Configure modes are disabled while the keyswitch is in the ENABLE position. This allows for protection against accidental changes to test conditions during normal operation.

Several printouts are available to provide a hard-copy output of test conditions, detailed bin count totals, or system configuration. This information can be output through the optional (Centronics-compatible) Parallel Printer Interface or through any of the optional communication interfaces.

In addition to the 20-character display, there are thirteen LEDs on the front panel that inform the user of the test results and the current operating status of the instrument.

The 5300 contains non-volatile memory, permitting all test conditions and communication parameters to be permanently stored until changed. This eliminates the need to reprogram the instrument every time it is powered up.

Calibration of the 5300 has been designed with convenience and safety in mind. The calibration values are changed through the use of the front-panel pushbuttons. Access holes are provided in the rear panel for the calibrations that require monitoring of internal conditions. The complete calibration procedure is accomplished without removing any of the cabinet covers or performing any mechanical adjustments.

Communication interfaces are available as options to allow the 5300 to communicate with a component handler or computer (using RS-232-C, RS-449/422, or GPIB). These interfaces allow a remote device to start a test, monitor the status of the test, and receive the results of the test. In addition, these interfaces allow test parameters to be read and changed.

Connection to the component handler is accomplished through the Test cable assembly. This cable assembly provides a pathway for two essential sets of signals: the test signals and the interlock signals. The test signals are found on two lines: HV Output, which carries the current applied to the DUT; and Sense Input which carries the current returned through the DUT. The interlock signals are used to monitor the status of two switches on the protective cover at the test head. The Test cable assembly also carries various logic signals that allow a test fixture to initiate a test and receive the results of a test. The Test cable assembly connects to the test connector that can be mounted either on the front or on the rear of the instrument.

1.4 FUNCTIONAL DESCRIPTION

The process of flash testing capacitors with the 5300 begins with powering up the instrument and setting the test conditions. The test conditions are viewed and set on the 20-character display through the use of the six front-panel pushbuttons and the access keyswitch or through the use of the communication interfaces.

Once the test conditions have been properly set (and the access keyswitch is in the ENABLE position), a capacitor is placed in the handler and is contacted by the test head probes. The 5300 is instructed to begin testing through one of the communication interfaces, through the Handler Interface, or through the Test cable assembly. The 5300 responds to the request by indicating (on the front panel, through the active communication interface, and through the Handler Interface) that it is testing and begins the Flash Test.

When the test is complete, the 5300 signals that testing is complete and displays the result on the front panel, through the communication interfaces that have requested results, and through the Handler Interface (if the handler initiated the test). The capacitor should be removed and processed according to the test results and another part should be put in its place.

SECTION 2
SPECIFICATIONS

2.1 EXPLANATION OF SPECIFICATION FORMAT

Each set of specifications in this section are made up of three entries: CHARACTERISTICS, PERFORMANCE REQUIREMENTS, and SUPPLEMENTAL INFORMATION. These entries are defined as follows.

CHARACTERISTICS - This entry indicates the distinguishing electrical, environmental, or physical feature or property that is being specified.

PERFORMANCE REQUIREMENTS - This entry indicates the maximum or minimum value allowed for the characteristic. It is the primary specification and is considered to be a commitment between ESI and the customer. This performance is considered essential for minimum product performance and most are verified as part of the calibration verification procedure.

SUPPLEMENTAL INFORMATION - This entry includes specifications that are secondary to the performance requirements. They are included for informational purposes only. They are not verified as part of the calibration verification procedure.

2.2 ESI-SUPPLIED EQUIPMENT

This section deals with the 5300, independent of the parts of the system provided by the user. The Performance Requirements of the user-supplied equipment (as listed in USER-SUPPLIED EQUIPMENT, Section 2.3) must be met for these specifications to apply to the complete system.

> **NOTE:** The specifications found in this section apply throughout the entire operating temperature and humidity ranges of the instrument.

2.2.1 Measurement System

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Stress Test		
Test Voltage	50 to 1250 VDC ±5%	Selectable in 10 V steps
Soak Time	0.00 to 0.99 s	Selectable in 0.01 s steps
	1.0 to 9.9 s	Selectable in 0.1 s steps
	10 to 199 s	Selectable in 1 s steps
	All Soak Times have an accuracy of -0/+5 ms	
Leakage Limit	1 to 250 uA ±5%	Selectable in 1 uA steps
	0.5 to 10 mA ±5%	Selectable in 0.5 mA steps
Charge Rate	2.5 mA and 5 to 50 mA ±10% from 20 to 80% of test voltage, excluding the first 500 ns of charge time	Selectable in 5 mA steps from 5 to 50 mA

> **NOTE:** For capacitors below about 100 pF, the actual Charge Rate through the DUT will be less than 50 mA. The expected (calculated) value of this current can be displayed. Refer to Calculated DUT Current Screens, Section 3.4.3.7.1.

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Check Test		
Test Voltage	0, 25, or 50 VDC ±5%	Selecting 0 volts will cause the Check Test to be omitted and the Part Present Test to be performed at 50 volts
Soak Time	0.00 to 0.99 s	Selectable in 0.01 s steps
	1.0 to 9.9 s	Selectable in 0.1 s steps
	10 to 199 s	Selectable in 1 s steps
	All Soak Times have an accuracy of -0/+5 ms	
Leakage Limit	1 to 250 uA ±5%	Selectable in 1 uA steps
	0.5 to 10 mA ±5%	Selectable in 0.5 mA steps
Charge Rate	50 mA ±10% from 20 to 80% of test voltage, excluding the first 500 ns of charge time	

NOTE: For capacitors below about 10 pF, the actual Charge Current through the DUT will be less than 50 mA. The expected (calculated) value of this current can be displayed. Refer to Calculated DUT Current Screens, Section 3.4.3.7.1.

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Part Present Test		
Test Voltage	25 or 50 VDC ±5%	Set as Check Voltage 50 volts is used when the Check Voltage is 0 volts
Charge Current	50 mA	See NOTE above
Nominal Capacitance		
Range	0.8 pF to 20 uF	Selectable in standard 5% steps

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
<u>RESULT LEDs</u>		
PASS		Indicates that the part passed all tests
NPP (No Part Present)		Indicates that the part failed the Part Present Test
St FAIL		Indicates that the part failed the Stress Test
Ck FAIL		Indicates that the part failed the Check Test
SHORT		Indicates that the part was shorted when testing began
ARC		Indicates that the part arced-over after the testing began
none		Indicates that a system error occurred

NOTE: Test results with greater detail can be obtained through the handler and communication interfaces, or from the Detail screens.

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
STATUS LEDs		
READY		Indicates that the 5300 is ready to begin the next test
TEST		Indicates that a test is currently in process
ERROR		Indicates that an error has occured
INTERLOCK		Indicates that the interlock system is open
Keylock Status		
ENABLE		Indicates that the Enable mode has been entered by the access keyswitch, allowing a test to be performed and disabling the Set and Configure modes
REMOTE		Indicates that a remote device has received control as requested through a communication interface The front panel is in the Enable mode
SET		Indicates that the Set or Configure mode is active, enabled by the access keyswitch

NOTE: Exactly one of the ENABLE, REMOTE, and SET LEDs will be illuminated when the 5300 is functioning.

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Displayed Bin Count Totals		
PASS	0 to 999,999	Total count of parts that pass all portions of test
FAIL	0 to 999,999	Total count of parts that fail the Stress or Check Tests, including ARCs and SHORTs
RETEST	0 to 999,999	Total count of parts whose tests were terminated by system errors or by failed Part Present Tests

NOTE: Although only six digits of the Bin Count Totals are displayed, they are stored internally with up to eight digits (99,999,999). If any value exceeds six digits, the left-hand digit is replaced (in the display) with a ? to indicate the overflow.

2.2.2 Interlock System

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Function	Prevents testing while test head cover is open	
Inputs		(2) SPST switches, installed and provided by user, connected to the test connector through the Test cable assembly

2.2.3 Handler Interface

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Inputs		
Signals		START and REQUEST
Requirements		Handler must sink 5 to 20 mA from the Interface 5 to 28 VDC must be supplied Built-in current-limiting for 5 VDC, external resistor required for higher voltages
Outputs		
Types of Signals		Test Status (ACTIVE, BUSY1, and BUSY2), Test Results (8 separate lines), and System Status (ALIVE)
Capabilities		Each output can sink up to 0.5 A at up to 28 VDC
Requirements		5 to 28 VDC
Test Results		Selectable (by front panel) for Binary (0 through 11111) or One-of-Nine (at most one of 8 binning outputs active)
Connector		Female, 36-pin, mates with Amphenol part number 57-10360

2.2.4 Communication Interfaces

2.2.4.1 GPIB Interface

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
General		Conforms to IEEE 488-1978 specifications
Mode		Acts as Talker or Listener
Line Terminators		
Input		LF, VT, FF, and EOI always accepted, CR can be selected as terminator
Output		EOI always used, CR or CR + LF can be selected as terminator
Interface Function subsets		C0, T6, SR1, RL1(?), PP1, DC1, DT1
Connector		Uses standard metric GPIB connector

2.2.4.2 RS-232-C Interface

NOTE: The 5300 does **not** support more than one Serial Interface (RS-232-C or RS-449) at a time.

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
General		Conforms to EIA RS-232-C specifications for asychronous communications on one channel (A) SQ, DRS, and clocks not supported
Baud Rates		Up to 19,200 baud
Protocol		7 or 8 data bits; Even, Odd, or No Parity; 1 or 2 Stop Bits
Handshaking		CTS and RTR supported, XON/XOFF can be selected CTS and DCD driven True (high) if not connected
Line Terminators		
Input		CR, LF, VT, and FF act as line terminators 0 length lines are ignored
Output		CR, LF, or CR + LF can be selected as terminators
Connector		Male DB-25
Mode		DTE

2.2.4.3 RS-449 Interface

NOTE: The 5300 does **not** support more than one Serial Interface (RS-232-C or RS-449) at a time.

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
General		Conforms to EIA RS-449 specifications Supports RS-422
Baud Rates		Up to 19,200 baud
Protocol		7 or 8 data bits; Even, Odd, or No Parity; 1 or 2 Stop Bits
Handshaking		CTS and RTR supported, XON/XOFF can be selected
Line Terminators		
Input		CR, LF, VT, and FF act as line terminators 0 length lines are ignored
Output		CR, LF, or CR + LF can be selected as terminators
Connector		Male DC-37
Mode		DTE

2.2.5 Power Requirements

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
AC Input	100 or 120 VAC ±10%, 1.0 A 200 or 240 VAC ±10%, 0.5 A	Selected by rear-panel switch
AC Frequency	47 to 63 Hz	
Fuse Type	1.5 A, 250 V slow blow for 100 or 120 VAC operation 0.75 A, 250 V slow blow for 200 or 240 VAC operation	Either 3AG or 5x20 mm

2.2.6 Environmental Specifications

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Temperature Operating Range	10 to 45°C	50 to 113°F Over-temperature condition will halt operation and display an error message
Storage Range	-40 to 71°C	-40 to 160°F
Humidity (relative) Operating Range	20 to 90% (non-condensing)	

2.2.7 Physical Dimensions

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Height	143 mm	5.75 in.
Width	435 mm	17 in.
Depth	425 mm	16.75 in.
Mass	11.5 kg	25 lbs (Weight)

2.3 USER-SUPPLIED EQUIPMENT

This section deals with the parts of the system that are provided by the user. It is essential that these specifications are met to allow the instrument to perform to the specifications listed in ESI-SUPPLIED EQUIPMENT, Section 2.2.

2.3.1 Test Head

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Probe Isolation	A minimum of 10 GΩ between probes A minimum of 100 MΩ between either probe and common or between either probe and shield	
Probe Capacitance	A maximum of 10 pF between probes	
Contact Resistance	A maximum of 1 Ω between either probe and the capacitor under test	

2.3.2 Handler

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Function		Positions DUTs under the test head Bins capacitors after testing
Control Requirements		If controlled by Handler Interface, handler must meet requirements of Section 2.2.3

2.3.3 Computer

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Function		Can set test conditions, initiate testing, receive test results
Communication Method		Must support one of the communication protocols used by the communication interfaces

2.3.4 Interlock System

CHARACTERISTICS	PERFORMANCE REQUIREMENTS	SUPPLEMENTAL INFORMATION
Function	Prevents testing while test head cover is open	
Inputs		(2) SPST switches, installed and provided by user, connected to the Test cable assembly

WARNING

THE SYSTEM MUST HAVE ADEQUATE COVERS TO SHIELD THE OPERATOR FROM THE TEST HEAD PROBES WHILE TESTING IS TAKING PLACE. THESE COVERS MUST BE CONNECTED TO THE INTERLOCK SYSTEM. NO TESTING SHOULD BE PERFORMED UNTIL PROPER OPERATION OF THE INTERLOCK SYSTEM HAS BEEN VERIFIED. FAILURE TO DO SO CAN CAUSE SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

SECTION 3
OPERATION AND PROGRAMMING

3.1 INTRODUCTION

This section provides all of the information necessary to learn how to operate the 5300. A complete discussion of the features on the front and rear panels is found in CONTROLS, CONNECTORS, AND INDICATORS, Section 3.2. An explanation of all information available on the 20-character display (except for display messages, which are explained in Section 6) is found in FRONT PANEL MODES, Section 3.4. For a quick exercise in powering up the instrument and setting test conditions, refer to FUNCTIONAL TEST, Section 3.3. The Handler Interface is covered in Section 3.6. The communication interfaces are covered in Section 3.7. Complete information regarding programming the instrument remotely through a communication interface (GPIB, RS-232-C, or RS-449), including sample programs, is found in PROGRAMMING, Section 3.9.

Operation of the 5300 consists of powering up the instrument, setting the test conditions, loading a Device-Under-Test (DUT) into the handler under the test head, and performing a test. The test conditions can be set either by the front-panel controls or through a communication interface. The test status and test results are displayed on the front-panel LEDs, and are output to the Handler Interface (if the handler initiated the test), and to any communication interfaces that have requested results.

3.2 CONTROLS, CONNECTORS, AND INDICATORS

3.2.1 Front Panel

The front panel of the 5300 contains a location for the test connector, an access keyswitch and LEDs, RESULT LEDs, STATUS LEDs, SELECT pushbuttons, SET pushbuttons, a POWER pushbutton, and a 20-character display. These are described in the following sections.

3.2.1.1 Test Connector

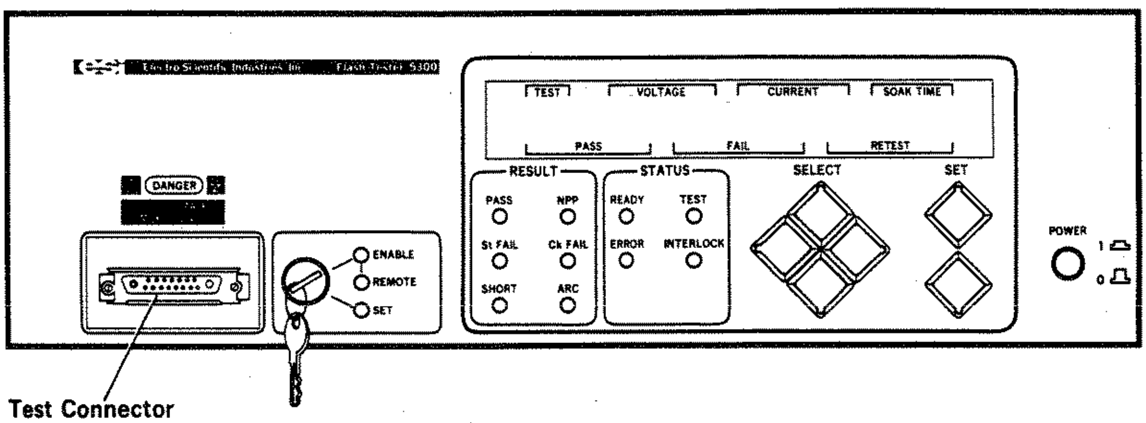


Figure 3-1. Front Panel Test Connector

At the far left of the front panel of the 5300 is one of two possible locations for the test connector. The alternate location for this connector is found on the rear panel. One of these locations must be covered by a blank panel. The Test cable assembly attaches to this connector and to the handler and test head.

This connector has a high voltage socket, a coaxial socket, and fifteen sockets for connector pins. The high voltage socket, called the HV Output, carries the test current to the DUT. The coaxial socket, called the Sense Input, carries the current returned from the DUT. The fifteen sockets carry various signals to monitor the interlocks (Interlock 1 and Interlock 2), to initiate testing (Start), and to indicate test results (Result). For more information on this connector, refer to Test Cable Assembly, Section 7.4.

3.2.1.2 Access Keyswitch and LEDs

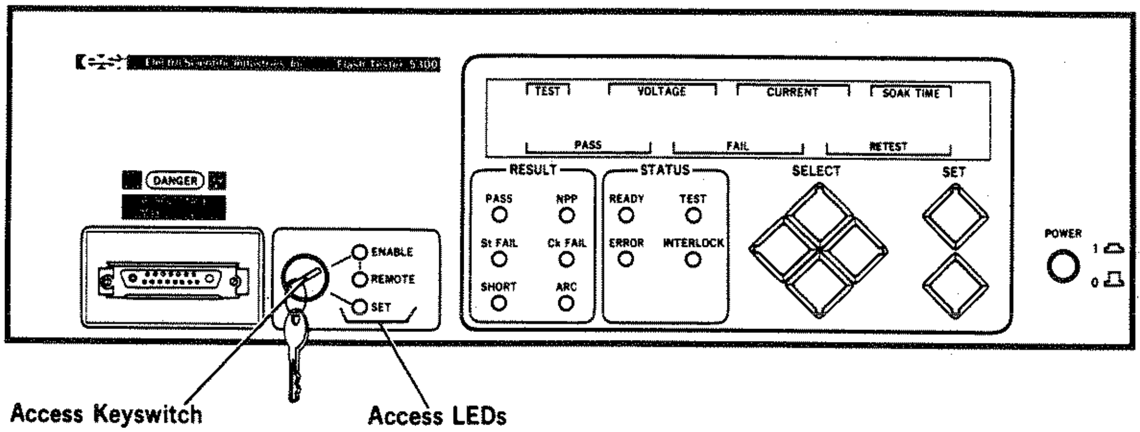


Figure 3-2. Access Keyswitch and LEDs

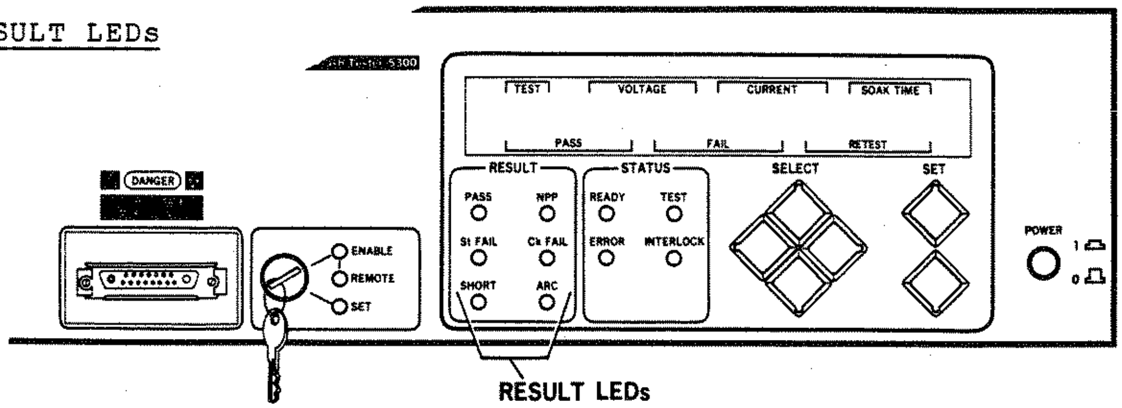
To the right of the test connector are the access keyswitch and LEDs. The keyswitch lets the user request either the Enable or the Set mode. The Enable mode allows a test to be initiated through the Test cable or by a basic handler, allows a remote device to gain control, and prevents any information from being changed through the use of front-panel controls. The ENABLE LED is illuminated (and the SET and REMOTE LEDs are off) whenever the Enable mode is activated.

The Set mode allows test conditions and Bin Count totals to be changed through the use of front-panel controls. The SET LED is illuminated (and the ENABLE and REMOTE LEDs are off) whenever the Set mode is activated.

The REMOTE LED is illuminated whenever a remote device has received control of the system. When the 5300 is in the Remote mode, information stored in the 5300 may be changed only by the remote device that has been given control. In addition, the Start input on the test connector is ignored when in the Remote mode, unless the remote device has specifically allowed it. For more information on the Remote mode, refer to REMOTE MODE, Section 3.8.

3.2.1.3 RESULT LEDs

Figure 3-3.
RESULT LEDs



In the middle of the front panel are the RESULT LEDs: PASS, NPP (No Part Present), St FAIL, Ck FAIL, SHORT, and ARC. After the completion of a test, one of these LEDs will illuminate to indicate the result of the test. This LED will remain illuminated until the next test is completed. The LEDs indicate the results as follows.

The PASS LED indicates that the DUT passed all tests.

The NPP LED (No Part Present) indicates that the DUT failed the Presence Test at the start of the Stress or Check test cycle. This indicates that the part is missing or open, or that there is a fault in either the test probes or the Test cable assembly.

The St FAIL LED indicates that the DUT exceeded the Stress Leakage Current after the Stress Time had passed, or that the DUT never reached the Stress Voltage.

The Ck FAIL LED indicates that the DUT exceeded the Check Leakage Current after the Check Soak Time had passed.

The SHORT LED indicates that the DUT performed as if it were shorted at the start of the test.

The ARC LED indicates that the DUT arced after the test began.

If an error terminates the test (opening the interlock, for example), none of the RESULT LEDs will be illuminated.

3.2.1.4 STATUS LEDs

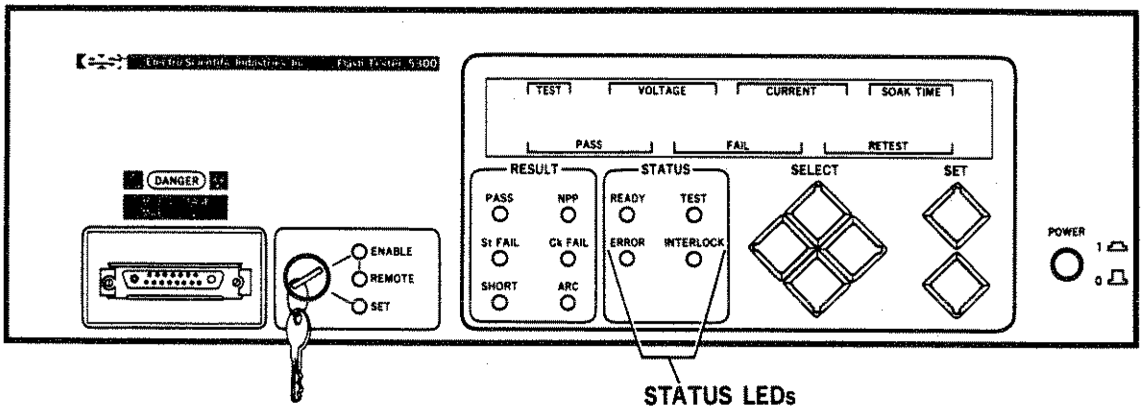


Figure 3-4. STATUS LEDs

To the right of the RESULT LEDs, there are four STATUS LEDs: READY, TEST, ERROR, and INTERLOCK. These LEDs indicate the results of the preceding test as follows.

The READY LED is illuminated when the instrument is ready to receive a request to start a test.

The TEST LED is illuminated while a test is being performed.

The ERROR LED is illuminated when a system error occurs. For information on the types of errors that can occur, refer to Print Detailed Bin Count Totals Screen, Section 3.4.3.5.3.

The INTERLOCK LED illuminates to indicate that an Interlock switch on the test head cover is open. This must be closed before a test can begin.

3.2.1.5 SELECT Pushbuttons

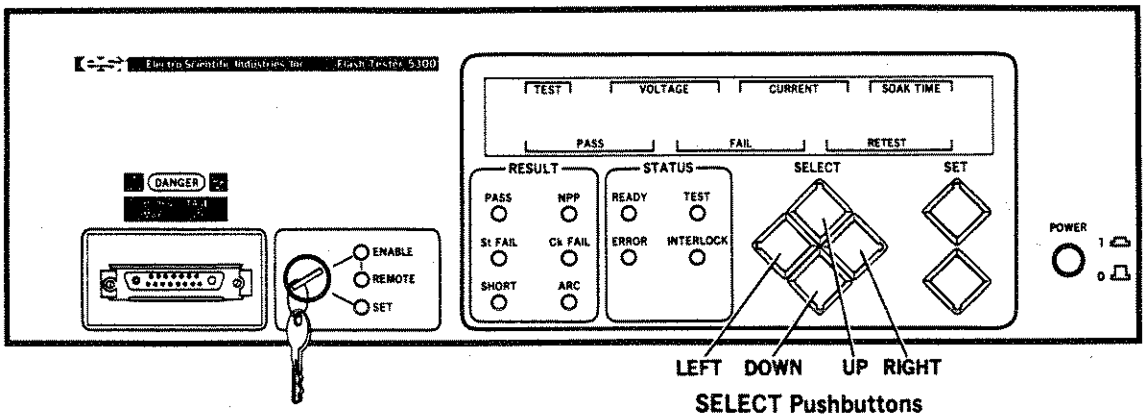


Figure 3-5. SELECT Pushbuttons

To the right of the STATUS LEDs are six pushbuttons with LEDs. Four of these are arranged in a diamond shape and are labeled SELECT. Within this manual these pushbuttons are named UP, DOWN, RIGHT, and LEFT as indicated in Figure 3-5. These pushbuttons allow the user to change from one screen (on the 20-character display) to another. The LED on each button, when illuminated, indicates that the pushbutton is active. That is, pressing and releasing the pushbutton whose LED is illuminated will have some effect on the 5300. For more information on the function of these buttons, refer to FRONT PANEL MODES, Section 3.4.

3.2.1.6 SET Pushbuttons

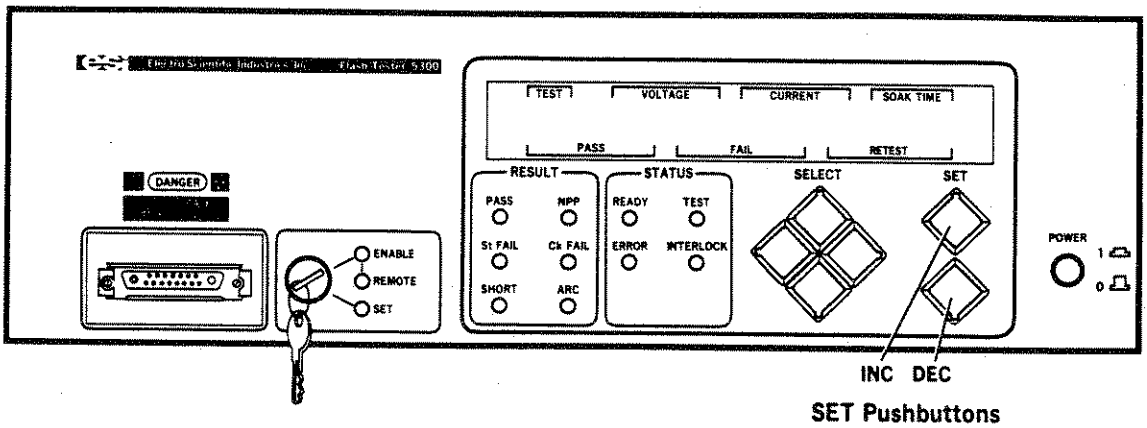


Figure 3-6. SET Pushbuttons

To the right of the four SELECT pushbuttons are the two SET pushbuttons. These buttons are used to change a value displayed on the 20-character display. Within this manual, these buttons are named INC (increment) and DEC (decrement) as indicated in Figure 3-6. The LED on each button, when illuminated, indicates that the pushbutton is active. That is, pressing and releasing the pushbutton whose LED is illuminated will have some effect on the 5300. For more information on the function of these buttons, refer to FRONT PANEL MODES, Section 3.4.

3.2.1.7 POWER Pushbutton

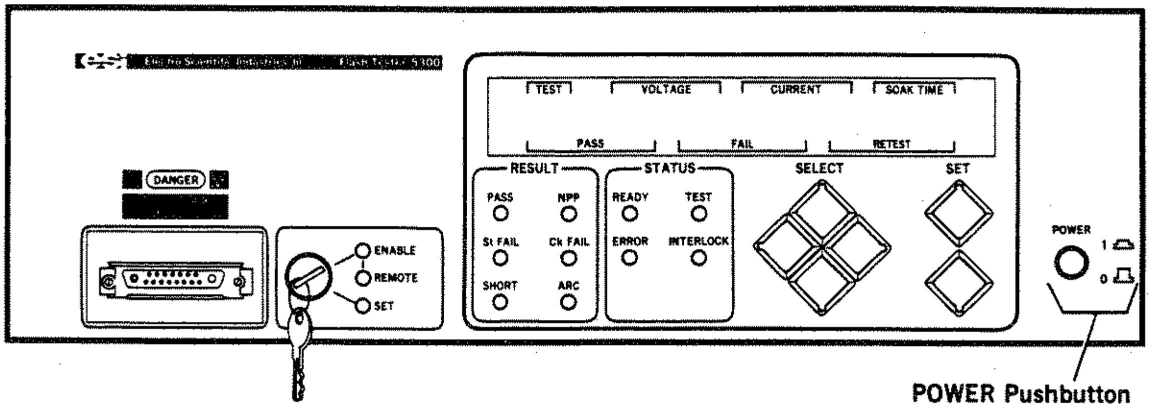


Figure 3-7. POWER Pushbutton

At the far right of the front panel is the POWER pushbutton. Pressing the button switches the 5300 between 1 (on) and 0 (off).

3.2.1.8 <u>20-Character Display</u>

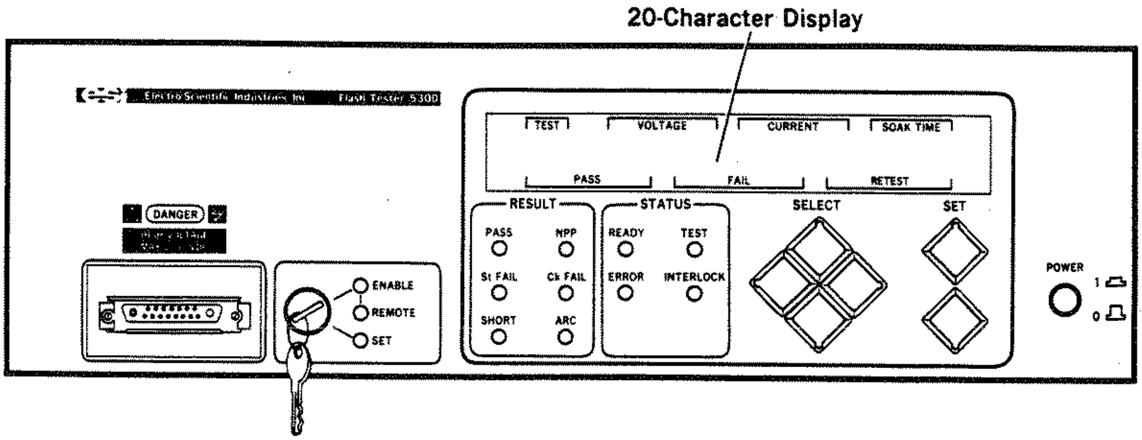


Figure 3-8. 20-Character Display

At the top of the front panel is the 20-character display. It displays the information selected by the SELECT pushbuttons and the access keyswitch, displays all error messages, and can display messages sent by remote devices. For information regarding the information displayed, refer to FRONT PANEL MODES, Section 3.4. For information on the error messages, refer to DIAGNOSTIC MESSAGES, Section 6. For information on displaying messages from remote devices, refer to PROGRAMMING, Section 3.9.

3.2.2 Rear Panel

The rear panel of the 5300 contains: slots for the CPU circuit assembly, Handler Interface, and communication interfaces; the power entry module; the fan; test point access holes; and a location for the test connector. These are described in the following sections.

3.2.2.1 <u>Circuit Assembly Slots</u>

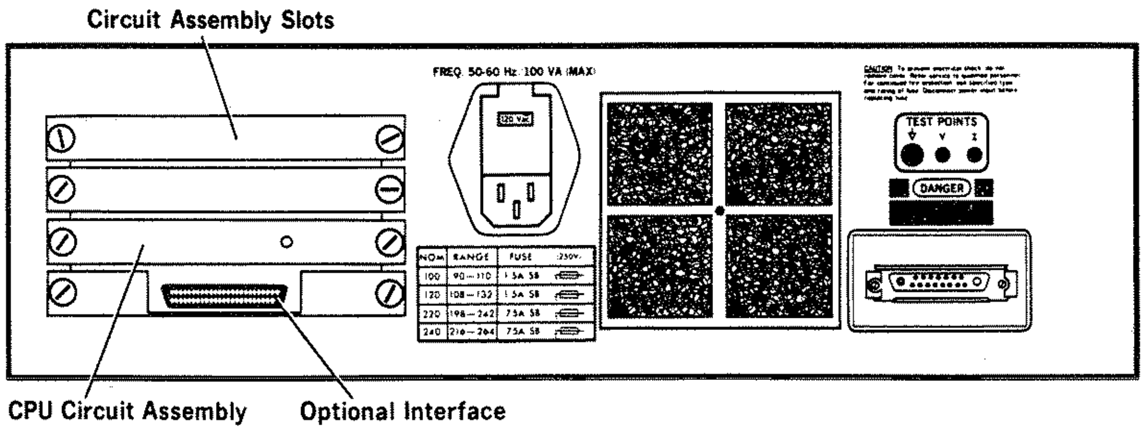


Figure 3-9. Circuit Assembly Slots

At the far left side of the rear panel are four slots into which circuit assemblies may be installed. When installed, these circuit assemblies plug into the connectors that form the system (IBU) bus. One of these slots must be occupied by the CPU circuit assembly. The other three slots are available for the Handler Interface and communication interfaces. Blank panels have been provided to cover any unused slots. Once the Handler Interface or one of the communication interfaces is installed, the signal connector on the interface will be exposed in this area. The CPU circuit assembly has an LED on the rear panel that illuminates to indicate that the system is operating. For more information about the installation of circuit assemblies, refer to OPTIONAL INTERFACE MECHANICAL INSTALLATION, Section 7.3. For more information on the operation of the Handler Interface, refer to HANDLER INTERFACE, Section 3.6. For more information on the operation of the communication interfaces, refer to COMMUNICATION INTERFACES, Section 3.7.

3.2.2.2 Power Entry Module

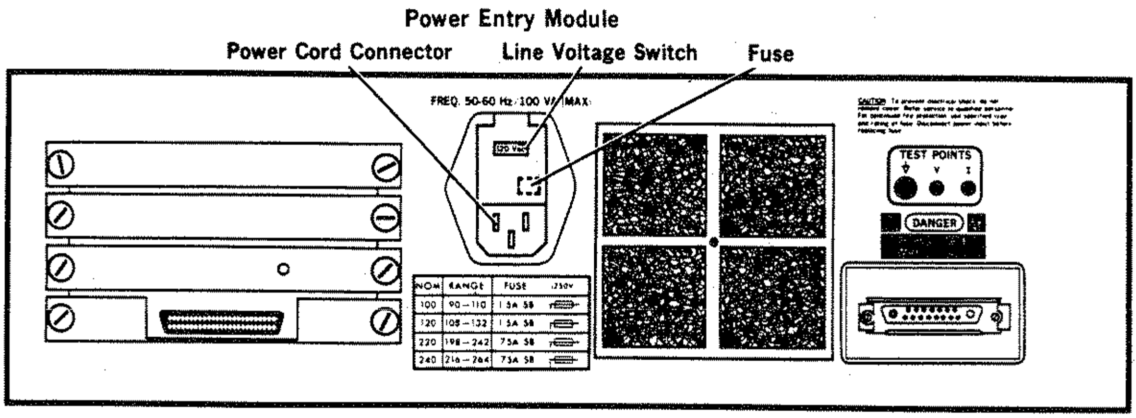


Figure 3-10. Power Entry Module

To the right of the circuit assembly slots is the power entry module. This serves three functions: allows the power cord to be connected to the instrument, sets the nominal line voltage, and contains the power line fuse. Before the unit is operated, the line voltage must be set to the nominal voltage to which the instrument will be connected. In addition, the appropriate fuse must be selected for the nominal line voltage. For more information on selecting the line voltage and fuse, refer to LINE POWER CONNECTION, Section 7.2.

3.2.2.3 Fan

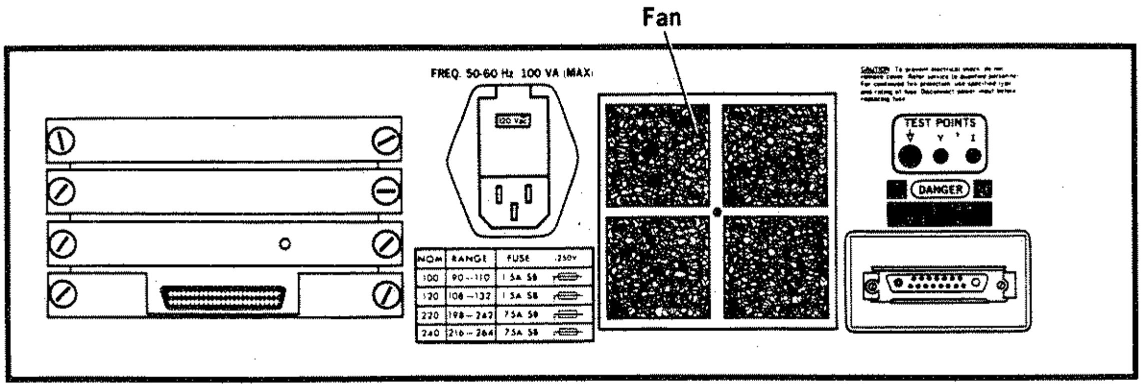


Figure 3-11. Fan

To the right of the power entry module is the fan. The fan filter should always be kept clean. Cleaning should be done on a regular basis, as often as the operating environment demands. For more information about servicing the fan filter, refer to MAINTENANCE, Section 5.3.

3.2.2.4 Test Point Access Holes

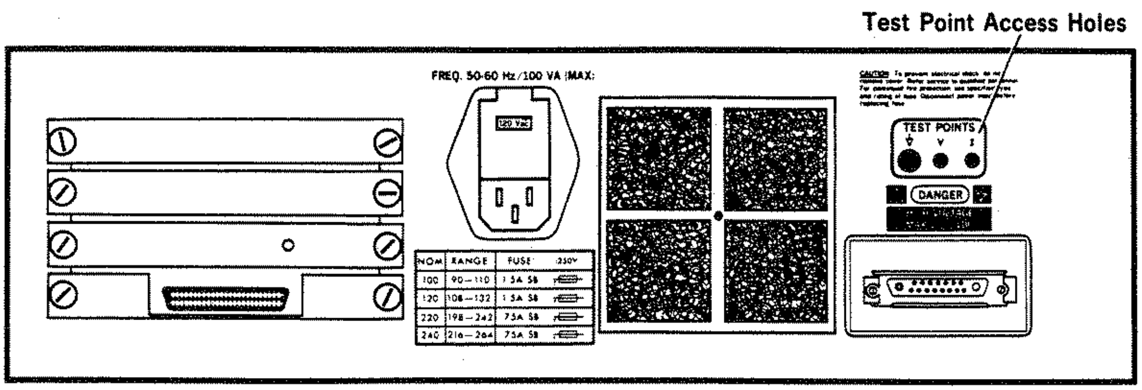


Figure 3-12. Test Point Access Holes

Near the upper-right corner of the rear panel are three test point access holes. As part of the calibration procedure, a test probe is inserted into each of these holes and an internal test point is contacted. For more information about the use of these access holes, refer to CALIBRATION, Section 5.2.

3.2.2.5 Test Connector

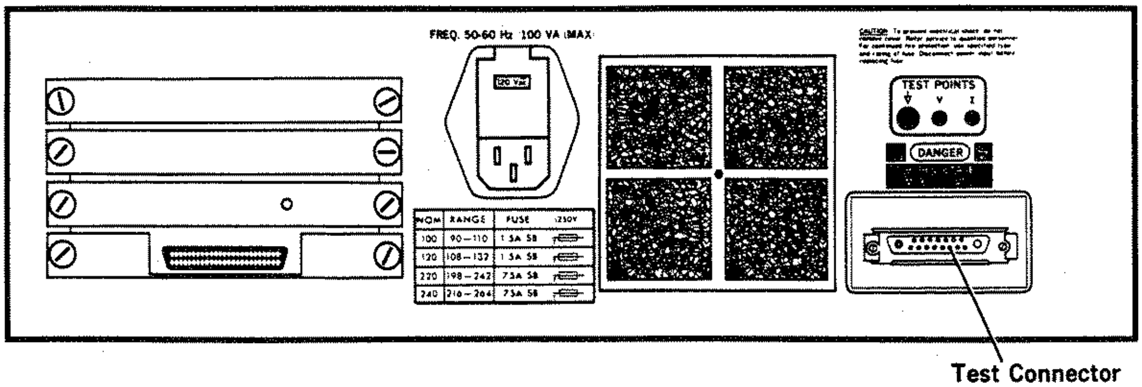


Figure 3-13. Rear Panel Test Connector

Near the lower-right corner of the rear panel is one of two possible locations for the test connector. The alternate location for this connector is found on the front panel. One of these locations must be covered by a blank panel. The Test cable assembly attaches to this connector and to the handler and test head.

This connector has a high voltage socket, a coaxial socket, and fifteen sockets for connector pins. The high voltage socket, called the HV Output, carries the test current to the DUT. The coaxial socket, called the the Sense Input, carries the current returned from the DUT. The fifteen sockets carry various signals to monitor the interlocks (Interlock 1 and Interlock 2), to initiate testing (Start), and to indicate test results (Result). For more information on this connector, refer to TEST CABLE ASSEMBLY, Section 7.4.

3.3 FUNCTIONAL TEST

This section provides a functional test of the 5300. It is provided to allow the user to quickly gain a familiarity with the operation of the instrument. It is recommended that the user read GENERAL DESCRIPTION, Section 1.3, before performing the procedure described in this section.

Although this test verifies that the general operation of the instrument is correct, it does **not** test the calibration of the instrument in any way. A Flash Test is not performed, nor can it be performed without further installation of the instrument. For a complete verification of the calibration of the instrument, refer to CALIBRATION, Section 5.2.

This procedure does not attempt to be complete in terms of identifying all functions and displays. Some terms are used that are not fully explained in this section. It is intended to guide the user through all of the normal operations that are required to prepare for a Flash Test.

For complete information on the terms, functions, and screens used in this section, refer to FRONT PANEL MODES, Section 3.4.

3.3.1 Introduction

Operation of the 5300 involves connecting the instrument to a source of line power, turning the POWER switch to 1 (on), setting the test conditions, connecting the device-under-test (DUT) to the Test cable assembly, and initiating a test. The following procedure will guide the user through all of these steps except for connecting the DUT and initiating a test.

3.3.2 Preparation

Before the 5300 can be used, it must be connected to a source of line power. In addition, the fuse and nominal line voltage switch must be checked and changed if incorrect. These steps are covered in PRELIMINARY CHECKOUT, Section 7.3. The procedure described in that section should be performed before continuing with this section. After this preliminary checkout is completed, the POWER switch should be pushed to return the instrument to 1 (on).

3.3.3 Initial Display

After the power-up sequence, the 20-character display indicates some test conditions that have been stored in memory. The following explanation assumes that the instrument is displaying the values shown in Figure 3-14.

Reading the displayed values and the labels printed above them, the following test conditions can be identified: Stress Test Voltage, Leakage Current, and Soak Time. The labels below the displayed values are ignored when the Stress test conditions are displayed. For more information, refer to Stress Test Screen, Section 3.4.3.1.

> **NOTE:** The names UP, DOWN, LEFT, RIGHT, INC (increment), and DEC (decrement) will be used for the six front-panel pushbuttons, as shown in Figure 3-15.

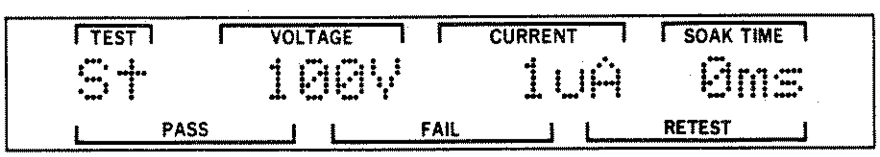


Figure 3-14. Stress Test Conditions Screen

3.3.3.1 Enable Mode

As the access keyswitch is in the ENABLE position and the ENABLE LED is illuminated, the Enable mode is active. In this mode, the 5300 will allow a test to be started from the Start input of the Test cable assembly or from a basic handler. Secondly, a remote device can gain control through the appropriate action. Finally, test conditions and Bin Count totals may be viewed, but not changed. The following STEPs demonstrate how to read the other test conditions.

STEP 1. Press any of the pushbuttons whose LEDs are **not** illuminated and observe that there is no effect. Press the DOWN pushbutton, whose LED is illuminated. The St at the left end of the display should change to Ck. The rest of the display will indicate the Check test conditions. An example of this is shown in Figure 3-15. For more information, refer to Check Test Screen, Section 3.4.3.2.

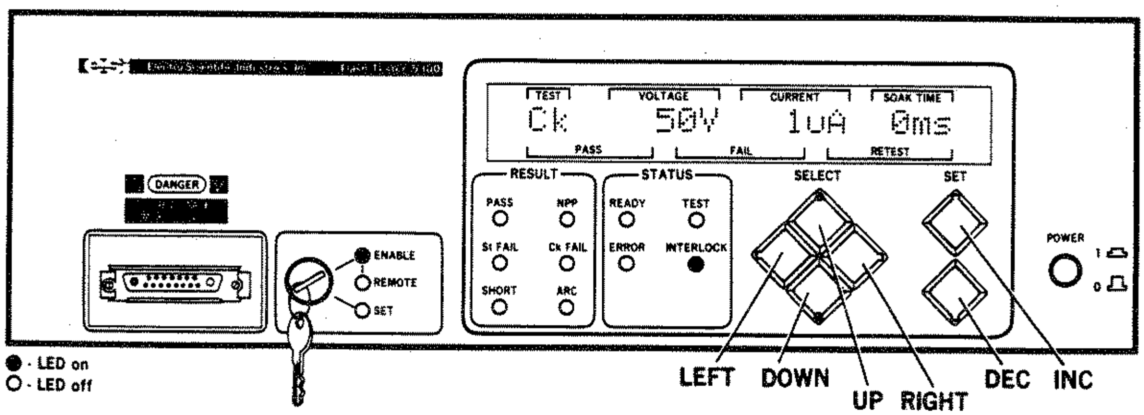


Figure 3-15. Check Test Conditions Display

STEP 2. Press the DOWN pushbutton. The display will change to indicate the Nominal Capacitance and the Charge Rate. An example of this screen is shown in Figure 3-16. For more information, refer to Nominal Capacitance and Charge Rate Screen, Section 3.4.3.3.

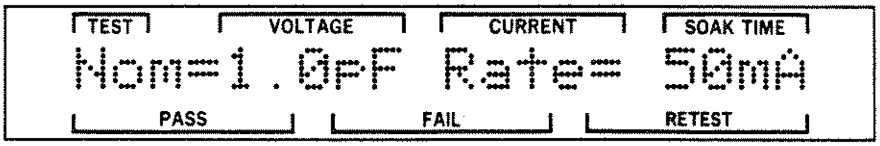


Figure 3-16. Nominal Capacitance and Charge Rate Screen

STEP 3. Press the DOWN pushbutton. The display will change to indicate the Presence Calibration value. Figure 3-17 is an example of this screen. For more information, refer to Presence Calibration Screen, Section 3.4.3.4.

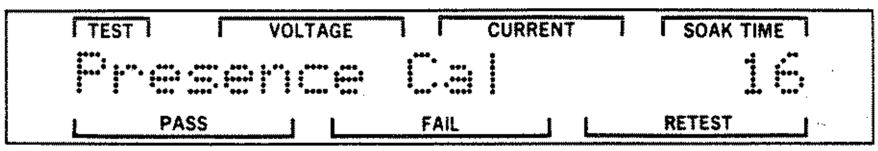


Figure 3-17. Presence Calibration Screen

STEP 4. Press the DOWN pushbutton. The display will change to the entry screen for the printed reports. Figure 3-18 is an example of this screen. For more information, refer to Printer Output Screens, Section 3.4.3.5.

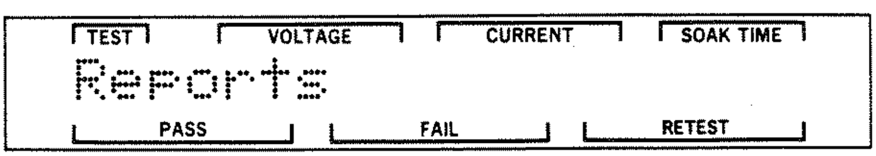


Figure 3-18. Printed Report Entry Screen

STEP 5. Press the DOWN pushbutton. The display will change to indicate the summary of Bin Count totals. In addition, the RIGHT pushbutton will illuminate. The labels under the display indicate that the numbers represent the total of passing parts, failing parts, and parts to be retested. Figure 3-19 is an example of this. For more information, refer to Bin Count Totals Screen, Section 3.4.3.6.

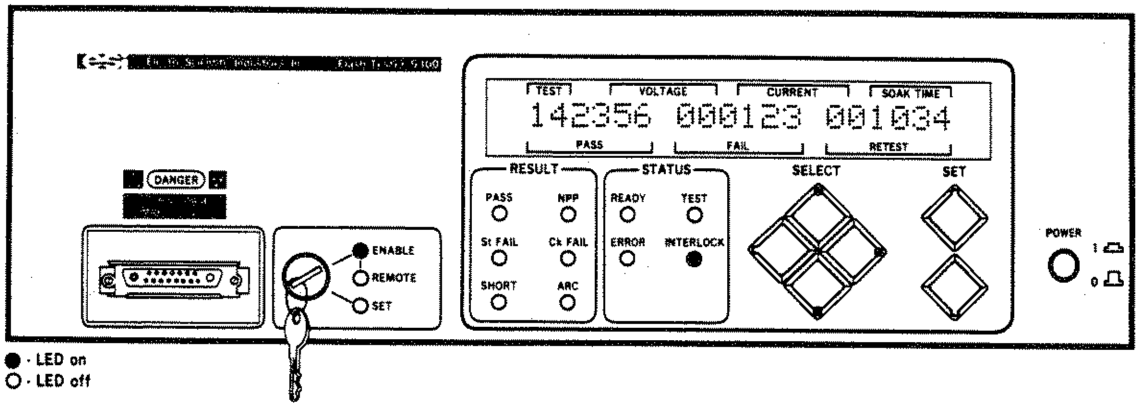


Figure 3-19. Bin Count Totals Display

STEP 6. Press the RIGHT pushbutton. The LEFT, UP, and DOWN LEDs should illuminate and the RIGHT LED should turn off. The display will show one of the Detail screens. Figure 3-20 is an example of one of these screens, the Calculated Stress Current display. For more information, refer to Detail Screens, Section 3.4.3.7.

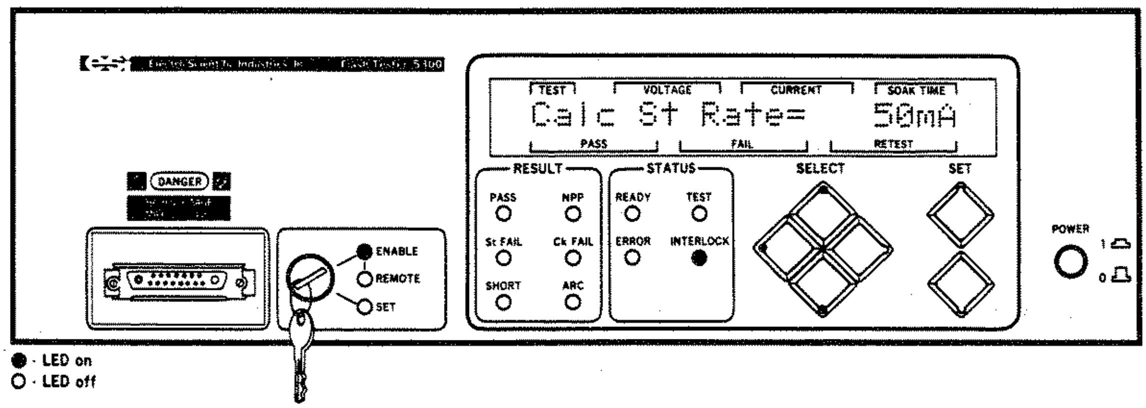


Figure 3-20. Calculated Stress Current Display

STEP 7. Press the DOWN pushbutton several times. Various Detail screens will be displayed. Figure 3-21 is an example of the total for the DUTs that failed the Stress test.

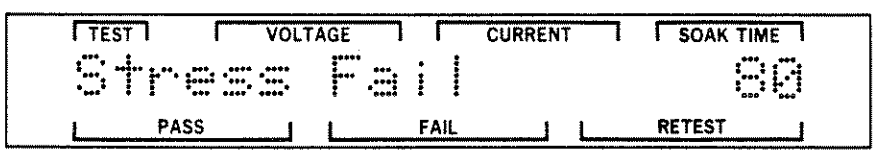


Figure 3-21. Stress Failure Total Screen

STEP 8. Return to the summary of Bin Count totals display by pressing the LEFT pushbutton.

STEP 9. Press the DOWN pushbutton several times and scroll through the various main screens of the Enable mode. Continue to press and release the DOWN pushbutton until the Bin Count Totals screen is displayed.

3.3.3.2 Set Mode

To allow the test conditions or Bin Count totals to be changed by the user, the Set mode must be entered. The following STEPs demonstrate how the Set mode is entered and the values are changed. While in the Set mode, the Start input on the Test cable assembly and on the Handler Interface will be ignored. Remote devices are **not** able to gain control when the 5300 is in the Set mode, although they are allowed to read values.

STEP 1. Enter the Set mode by turning the access keyswitch from the ENABLE position to the SET position. Refer to Figure 3-22 for the location of the access keyswitch.

STEP 2. When the system enters the Set mode, the SET LED should illuminate. Refer to Figure 3-22 for an example of this mode.

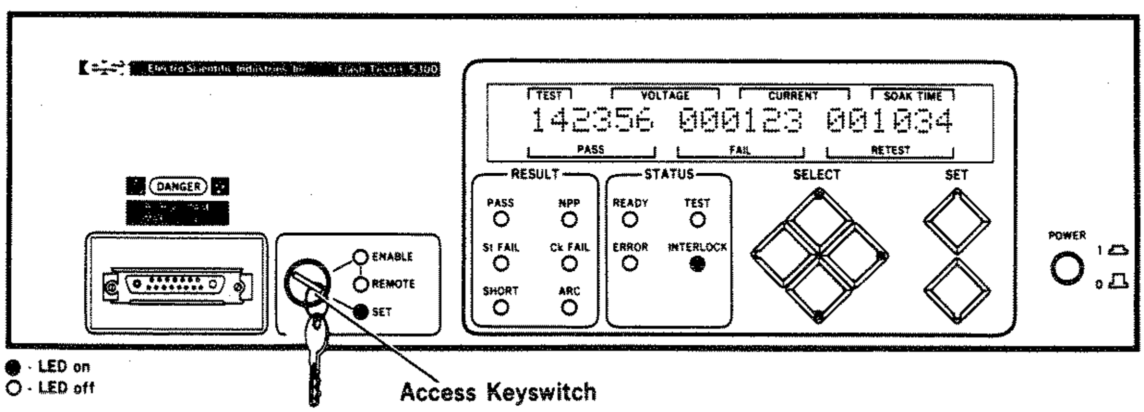


Figure 3-22. Set Mode Display

STEP 3. Before any other values can be changed, the Bin Count totals must be reset to 0. Press the RIGHT pushbutton to display one of the Detail screens. Press the UP or DOWN pushbutton until the Reset Bin Count Totals screen is displayed. Figure 3-23 is an example of this screen.

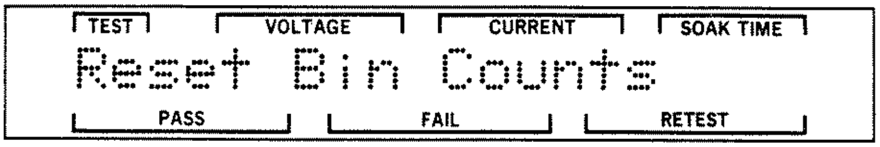


Figure 3-23. Reset Bin Count Totals Screen

STEP 4. Press the RIGHT pushbutton to reset the totals. Press the DOWN pushbutton several times to observe the individual totals that have been reset to 0.

STEP 5. Press the LEFT pushbutton to return to the Bin Count Totals screen. Press the UP or DOWN pushbutton three times to display the Nominal Capacitance and Charge Rate screen. Figure 3-24 is an example of this screen.

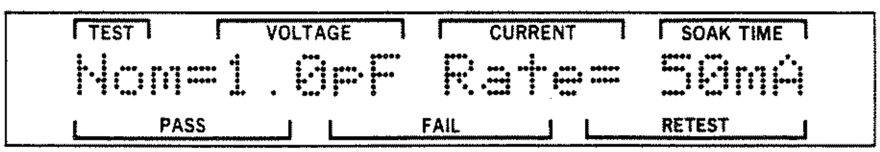


Figure 3-24. Nominal Capacitance and Charge Rate Screen

STEP 6. Press the RIGHT pushbutton. The display of the Charge Rate should disappear. This leaves only the Nominal Capacitance on the display, indicating that it can be changed. The LEDs on one or both of the INC (increment) and DEC (decrement) pushbuttons should illuminate. The INC and DEC pushbuttons are used to change the value that is displayed.

STEP 7. Press the INC pushbutton and hold it down until the LED is no longer illuminated. If the LED on this pushbutton is not illuminated, skip this STEP.

STEP 8. The display should indicate the maximum Nominal Capacitance that can be set. In addition, the LED on the INC pushbutton should not be illuminated. Figure 3-25 is an example of this.

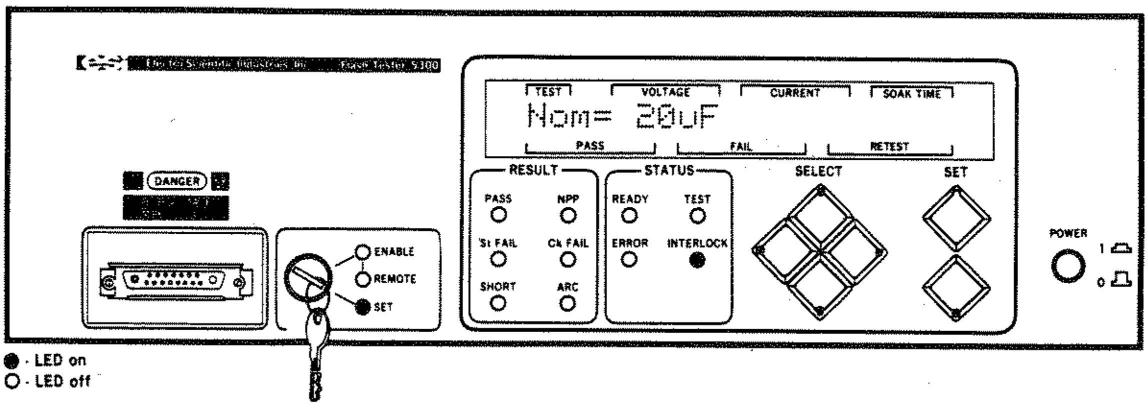


Figure 3-25. Setting the Nominal Capacitance

STEP 9. Press the DEC pushbutton once. The Nominal Capacitance should step to the next lower value.

STEP 10. Notice that the LED on the INC pushbutton has illuminated, indicating that this button will have an effect. Press the INC pushbutton to verify that it has an effect.

STEP 11. Hold the DEC pushbutton down and notice the effect that it has on the Nominal Capacitance. It should decrease in value, slowly at first, then quicker as the button is held down. Eventually the lowest Nominal Capacitance value is reached and the LED on the DEC pushbutton is no longer illuminated. Figure 3-26 is an example of this.

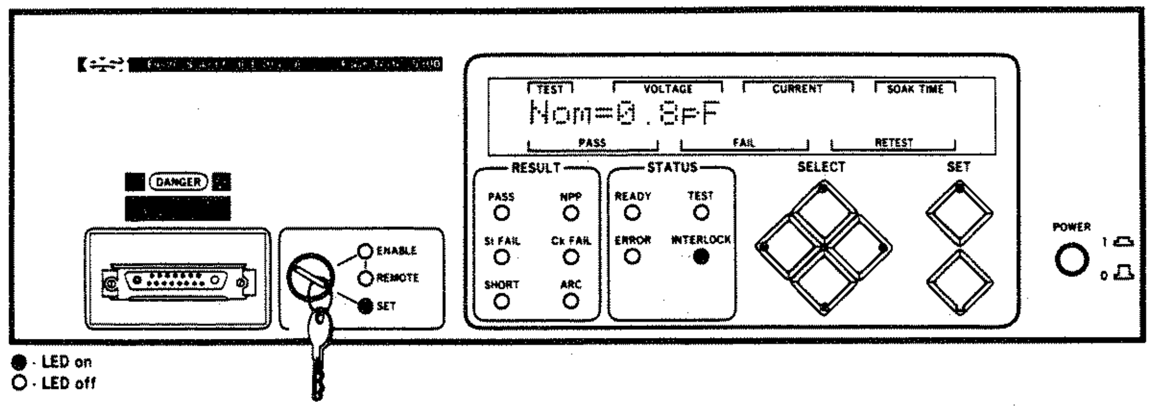


Figure 3-26. Setting the Lowest Nominal Capacitance

STEP 12. Press the RIGHT pushbutton to finish setting the Nominal Capacitance and to allow setting the Charge Rate. The Nominal Capacitance screen should disappear and the Charge Rate should appear, as indicated by the text in the display.

STEP 13. Hold the DEC pushbutton down until its LED is no longer illuminated. The display should indicate the lowest Charge Rate available. Figure 3-27 is an example of this.

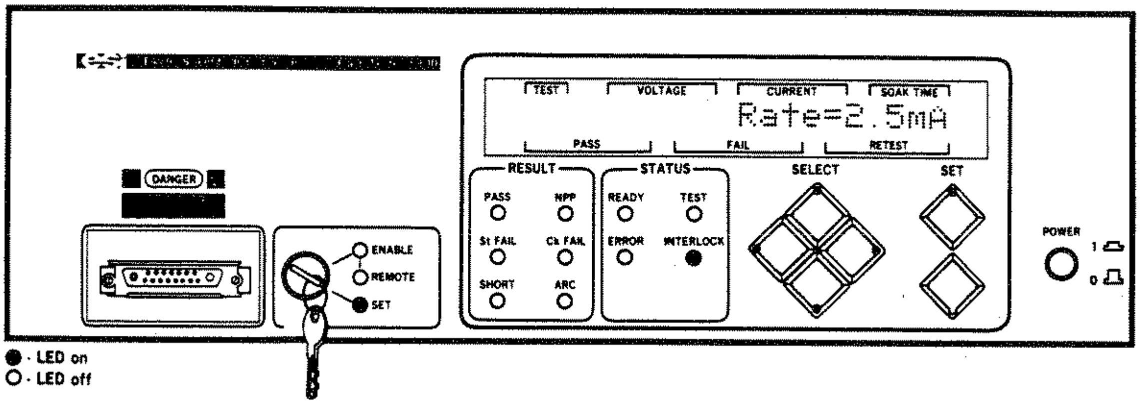


Figure 3-27. Setting the Lowest Charge Rate

STEP 14. Hold down the INC pushbutton and observe the effect it has on the display. As with the Nominal Capacitance screen, the value increases slowly at first, then faster. To finish setting the Charge Rate, press the RIGHT pushbutton once. The display will return to indicating both the Nominal Capacitance and the Charge Rate. Notice that neither the LED on the INC pushbutton nor on the DEC pushbutton is illuminated. Figure 3-28 is an example of this.

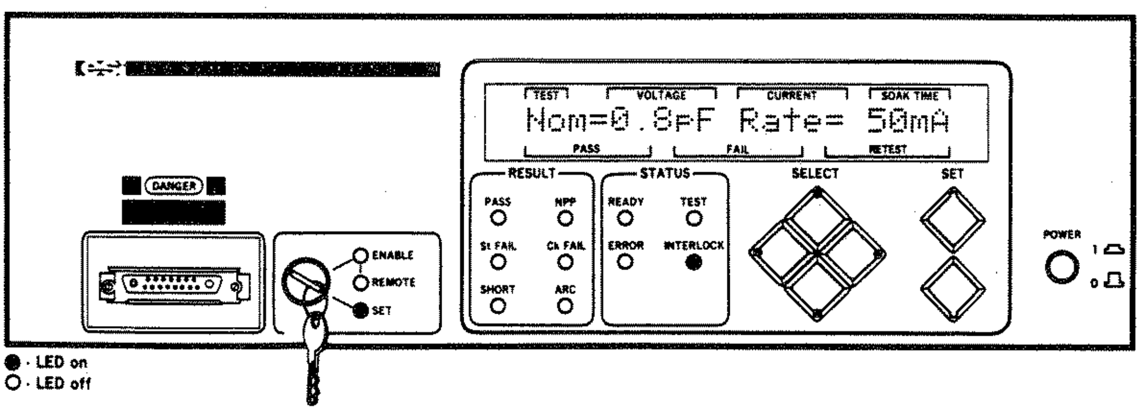


Figure 3-28. Nominal Capacitance and Charge Rate Display

STEP 15. Press the UP pushbutton. The display should indicate the Check test conditions. Press the UP pushbutton again. The display should indicate the Stress test conditions. Notice that neither the INC LED nor the DEC LED are illuminated, indicating that the test conditions cannot be changed. Figure 3-29 is an example of this.

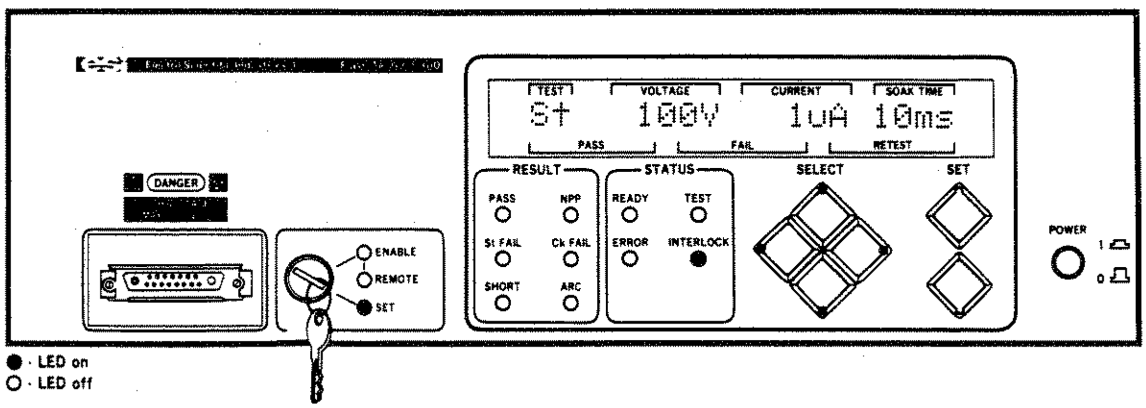


Figure 3-29. Stress Test Conditions Display

STEP 16. Press the RIGHT pushbutton. Notice that the Stress Voltage is the only value displayed, indicating that it may be changed. Also notice that the LEDs on the INC and DEC pushbuttons are illuminated, indicating that the displayed value can be increased or decreased. Change the displayed value using the INC and DEC pushbuttons.

STEP 17. Change the Stress Leakage Current by pressing the RIGHT pushbutton, followed by either of the INC and DEC pushbuttons. Press the RIGHT pushbutton twice to return to displaying the Stress test conditions.

STEP 18. Exit the Stress test conditions by pressing the DOWN pushbutton. Notice that the Check test conditions are displayed. Figure 3-30 is an example of this screen.

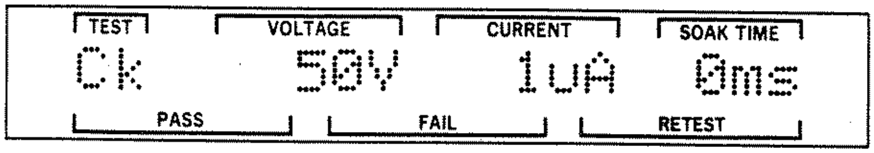


Figure 3-30. Check Test Conditions Screen

STEP 19. Press the DOWN pushbutton twice to indicate the Presence Calibration value. Notice that the LED on the RIGHT pushbutton is illuminated. Pressing the RIGHT pushbutton will enable this calibration to be performed. Figure 3-31 is an example of this display. Before the Presence Calibration may be performed, the full installation must be performed.

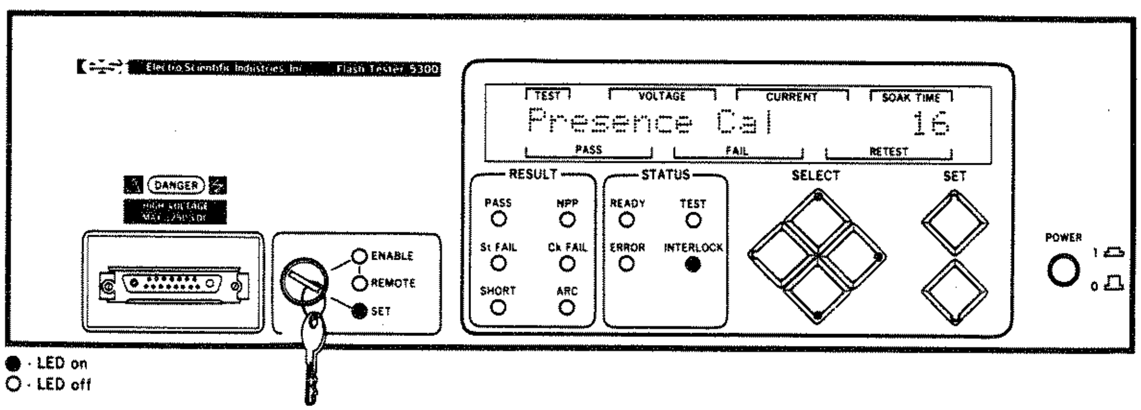


Figure 3-31. Presence Calibration Display

STEP 20. Press the DOWN pushbutton twice to display the Bin Count totals. Press the DOWN pushbutton again to display the Stress test conditions. Press the DOWN pushbutton five more times and notice that six screens (Stress test, Check test, Nominal Capacitance and Charge Rate, Presence Calibration, Printer Output, and Bin Count totals) are shown, one after the other. The last screen shown is the summary of Bin Count totals screen, as shown in Figure 3-32.

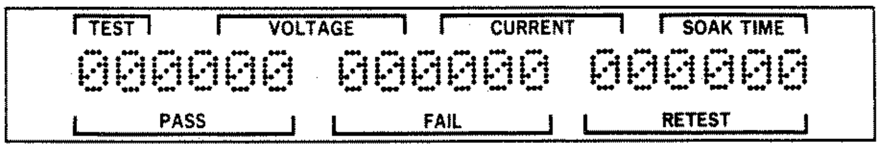


Figure 3-32. Bin Count Totals Screen

3.4.3.3 Configure Mode

The last of the three front panel modes is the Configure mode. When in this mode, communication parameters, major calibration values, and Maximum Voltage can be inspected and changed and the Breakdown Test can be performed. In addition, normal testing (other than the Breakdown Test) cannot be initiated, nor can a remote device gain control. The following steps demonstrate how to enter the Configure mode from the Set mode and how the values are inspected and changed.

STEP 1. While still in the Set mode (at the Bin Count Totals screen), press the UP pushbutton three times to return to the Nominal Capacitance and Charge Rate screen. Press INC and DEC simultaneously to enter the Configure mode. Refer to Figure 3-33.

NOTE: Pressing the INC and DEC pushbuttons in the last step is the only instance in which pressing a pushbutton whose LED is not illuminated has an effect.

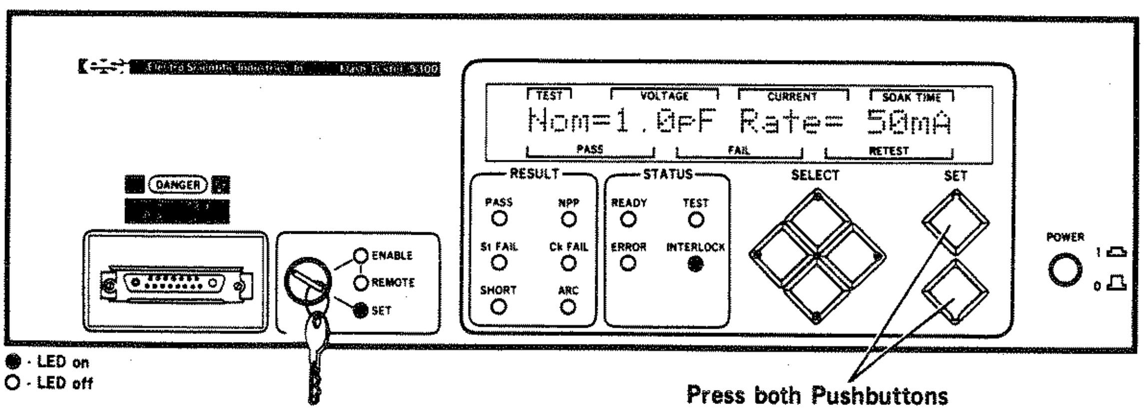


Figure 3-33. Entering the Configure Mode

STEP 2. The first time after power up (or Reset) that the Configure mode is entered, the display should indicate the Instrument Identification. Press the DOWN pushbutton once to change to the Maximum Voltage display. To change this value, press the INC or DEC pushbuttons. Refer to Figure 3-34.

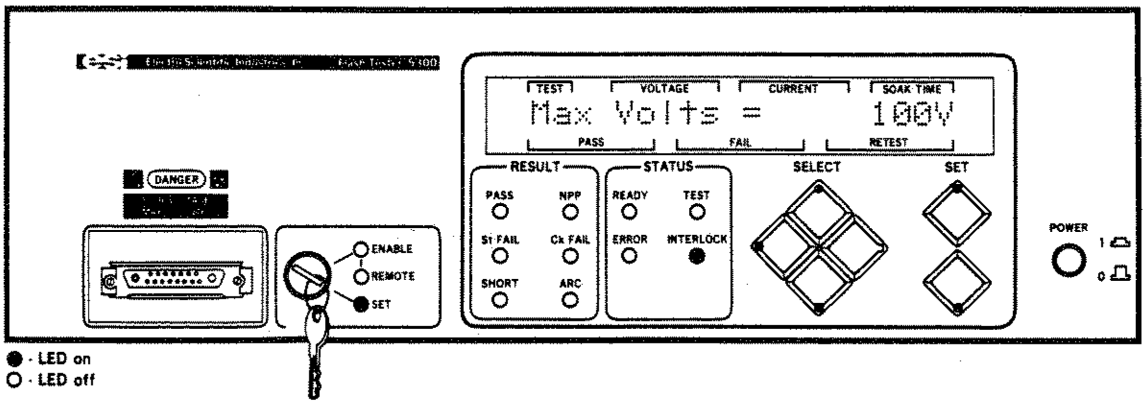


Figure 3-34. Changing the Maximum Voltage

STEP 3. Press the DOWN pushbutton to display the Stress Test Stray Calibration screen. This calibration (and the calibrations that follow) cannot be performed until the installation has been completed. Figure 3-35 is an example of this screen. For information on performing this and the other calibrations, refer to CALIBRATION, Section 5.2. For information on installing the instrument, refer to INSTALLATION, Section 7.

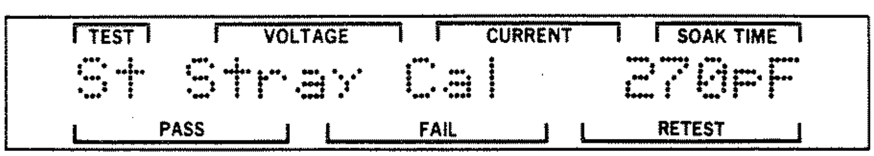


Figure 3-35. Stress Test Stray Calibration Screen

STEP 4. Press the DOWN pushbutton to display the Check Test Stray Calibration screen.

STEP 5. Press the DOWN pushbutton to display the HV Clamp Calibration screen.

STEP 6. Press the DOWN pushbutton once. The 5300 will display the Reset Entry screen. This screen provides access to the system resets. Figure 3-36 is an example of this screen. Press the RIGHT pushbutton to display one of the resets.

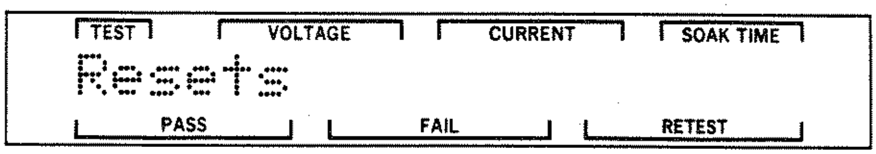


Figure 3-36. Reset Entry Screen

CAUTION

PRESSING THE "RIGHT" PUSHBUTTON IN THE FOLLOWING STEP WILL CAUSE A RESET TO BE PERFORMED. IF AN INSTALLATION RESET OR A GLOBAL RESET IS PERFORMED, A NEW CALIBRATION MUST BE PERFORMED.

STEP 7. Press the UP or DOWN pushbutton several times to view the available resets. The resets are activated by pressing the RIGHT pushbutton when one is displayed. Press the LEFT pushbutton to return to the Reset Entry Screen.

STEP 8. Press the DOWN pushbutton to display the Handler Interface Entry screen. This screen provides access to the individual Handler screens. Figure 3-37 is an example of this screen.

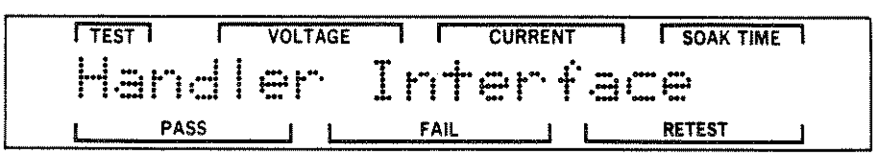


Figure 3-37. Handler Entry Screen

STEP 9. If a Handler Interface is **not** installed, the RIGHT LED will not be illuminated and this step should be skipped. Press the RIGHT pushbutton to display one of the Handler screens. Press the UP or DOWN pushbutton to scroll through each of the Handler screens. These screens indicate which parameters may be changed. For information regarding the use of each parameter, refer to HANDLER INTERFACE, Section 3.6. Press the LEFT pushbutton to return to the Handler Entry screen.

STEP 10. Press the DOWN pushbutton twice to display the Serial Entry screen and the GPIB Entry screen. These screens provide access to the individual Serial and GPIB screens. These individual screens can be accessed (if the appropriate interface is installed) by pressing the RIGHT pushbutton.

STEP 11. Press the DOWN pushbutton to advance to the Printer Entry screen. This screen provides access to the individual Printer screens. Figure 3-38 is an example of this screen.

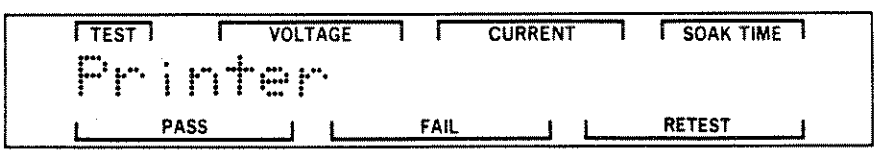


Figure 3-38. Printer Entry Screen

STEP 12. Press the RIGHT pushbutton to display one of the Printer screens. Press the UP or DOWN pushbutton to scroll through the Printer screens. For information regarding the use of each parameter, refer to Printer Entry Screen, Section 3.4.5.12.

STEP 13. Press the LEFT pushbutton to return to the Printer Entry screen.

STEP 14. Press the DOWN pushbutton to display the Breakdown Test screen. The Breakdown test cannot be performed until the installation is complete. For information on the Breakdown test, refer to Breakdown Test Screen, Section 3.4.5.8.

STEP 15. Press the DOWN pushbutton. The Instrument Identification screen should be displayed.

STEP 16. Press the DOWN pushbutton several times to scroll through the different screens.

STEP 17. Exit the Configure mode by pressing the LEFT pushbutton. The display should return to the Set mode, Nominal Capacitance and Charge Rate screen.

STEP 18. Exit the Set mode by turning the access keyswitch to the ENABLE position. The display should return to the Enable mode, the LEDs on the RIGHT and LEFT pushbuttons should turn off, the ENABLE LED should illuminate, and the SET LED should turn off. This concludes the Functional Test.

3.4 FRONT PANEL MODES

The 5300 provides three different front panel modes: Enable, Set, and Configure. This section provides complete information about each of these modes. In addition, a general description of the use of the front-panel pushbuttons is given. For a quick "tour" through these modes, refer to FUNCTIONAL TEST, Section 3.3. It is recommended that the procedures described in that section are performed before proceeding with the following sections.

3.4.1 General Overview

The four front-panel SELECT pushbuttons (UP, DOWN, RIGHT, and LEFT) allow the user to select the type of information that is displayed on the 20-character display. The user has the option of displaying the Stress test conditions, Check test conditions, Nominal Capacitance and Charge Rate, Presence Calibration value, Printer Output number, or Bin Count totals (summary and detailed) at any time. If the access keyswitch is in the ENABLE position and the ENABLE LED is illuminated, these are all that can be selected for display and the user is unable to change these values from the front panel. This front panel mode is referred to as the Enable mode as it allows a remote device to gain control of the system and allows a test to be initiated through the use of the START line on the Handler Interface and on the Test connector.

If the access keyswitch is in the SET position and the SET LED is illuminated, the user may change (from the front panel) the values shown in the display or perform a Presence calibration. This front panel mode is referred to as the Set mode.

When in the Set mode, access can be gained to the third front panel mode, the Configure mode. The Configure mode allows the user to view and change all remaining parameters, to perform calibrations and resets, and to perform a Breakdown Measurement.

3.4.2 Using the Pushbuttons

There are six pushbuttons on the front panel. For reference within this manual, they will be referred to by the following names: UP, DOWN, LEFT, RIGHT, INC (increment), and DEC (decrement). Figure 3-39 illustrates the location of each of these buttons.

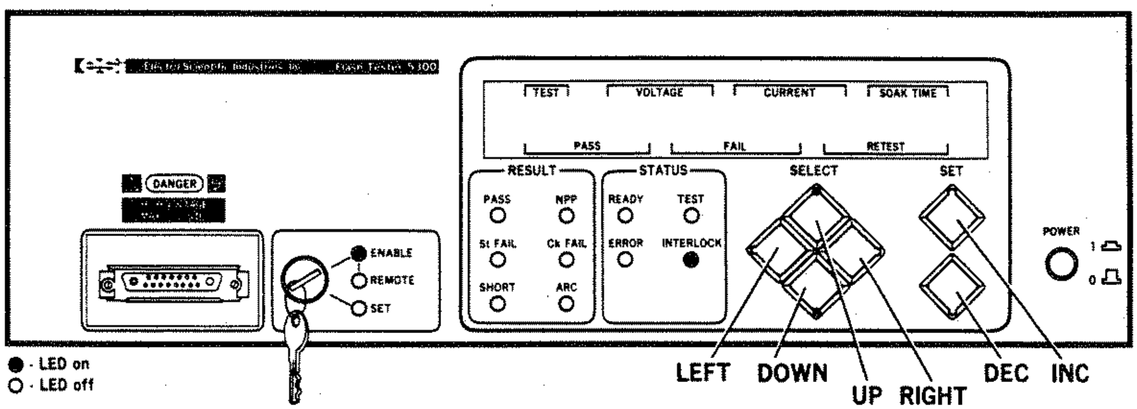


Figure 3-39. Front Panel Pushbuttons

Each pushbutton has an LED to indicate its active status. When the LED on a particular pushbutton is not illuminated, pressing that pushbutton will have no effect.

The UP and DOWN pushbuttons allow the entire display to be changed from one group of information (called "screens" in this manual) to another. For example, one can change from a display of Stress test conditions to Check test conditions by pressing the DOWN pushbutton. The RIGHT and LEFT pushbuttons allow selection of which individual value is to be changed (when in the Set mode). For example, once the Check test conditions are displayed, pressing RIGHT allows the Check voltage to be changed. The INC and DEC pushbuttons change the individual value that was selected by the RIGHT and LEFT pushbuttons.

The RIGHT pushbutton also provides access to sub-screens. For example, when the Printer Output Entry screen is displayed, pressing the RIGHT pushbutton changes to one of the Printer Output screens. The LEFT pushbutton is used to return from a sub-screen.

On certain screens, the RIGHT pushbutton performs the function displayed. For example, when the Print Header screen is displayed, pressing the RIGHT pushbutton instructs the 5300 to send the header information to the printer.

The organization of screens may be more easily understood through the use of "maps" of the screen locations. For this purpose, Figure 3-40 is provided.

Figure 3-40 contains the names of the screens that are available when in the Enable mode: Stress test conditions, Check test conditions, Nominal Capacitance and Charge Rate, Presence Calibration, Printer Output Entry, and Bin Count totals. These names are put in a vertical column with the Stress test conditions at the top and following the listed order. In this way, the relative location of the name in the list indicates how that screen is reached. For example, Check test conditions is below Stress test conditions, indicating that the display can be changed from Stress test conditions to Check test conditions by pressing the DOWN pushbutton. Similarly, the display can be changed in the opposite direction by pressing the UP pushbutton.

In a similar fashion, the diagram includes the effects of the RIGHT and LEFT pushbuttons. As indicated, pressing RIGHT when the Printer Output screen is displayed will select one of the Printer Output screens. Diagrams of this sort have been provided in the following sections to illustrate how the available screens in the different modes are reached.

3.4.3 Enable Mode

The Enable mode allows the following: a test may be initiated through the Test cable assembly or by a Basic handler; the user may inspect (but not change) the test conditions; the user may send output to the printer; the user may read the Bin Count totals (summary and detailed); and a remote device may read information or gain control of the instrument. The test conditions consist of: Stress Test Voltage, Leakage Current, and Soak Time; Check Test Voltage, Leakage Current, and Soak Time; and the Nominal Capacitance and Charge Rate. For information on gaining control with a remote device, refer to Remote Modes, Section 3.5.

Figure 3-40 is "map" of the screens, provided to indicate the relative "location" of each of these screens.

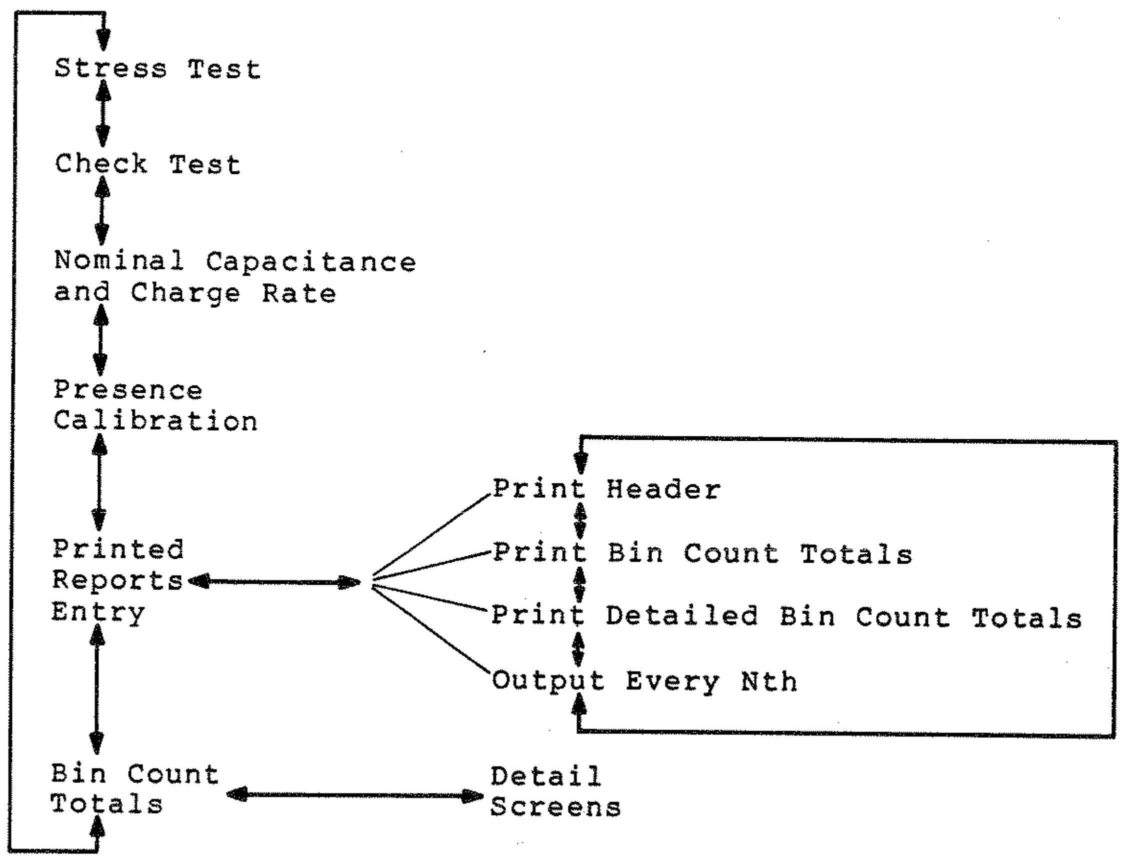


Figure 3-40. Enable Mode Screen Diagram

3.4.3.1 Stress Test Screen

Figure 3-41 is provided as an example of the Stress test screen as displayed on the 20-character display. This is the first screen seen after the power-up sequence. This screen indicates the conditions of the Stress test.

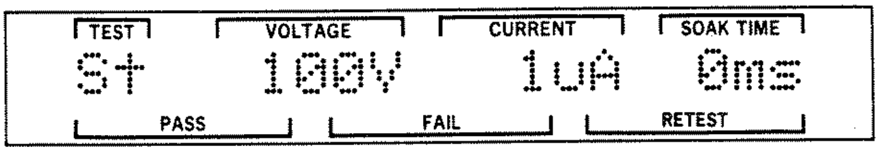


Figure 3-41. Stress Test Screen

The Stress test screen displays the three test conditions for the Stress test: voltage, leakage current, and soak time, as indicated by the labels above the display. The Stress test is the first part of the Flash Test (it begins with the Part Present Test), as shown in Figure 3-42. During the Stress test, the DUT is charged with a constant current (Charge Rate) to a voltage (Stress test voltage) typically much higher than its rated voltage. This voltage is maintained on the DUT for the Stress test soak time, after which the amount of current required to maintain the voltage is compared to the Stress leakage current. If the Stress leakage current is exceeded, the Flash Test ends and the part is a Stress test failure. If the Stress leakage current is not exceeded, the DUT is discharged and the Flash Test continues to the next stage, the Check test.

The "St" at the left end of the display indicates that this is the Stress test screen. The test voltage shown in this example is 100 volts. The soak time is indicated as 0 milliseconds. The leakage current is indicated as 1.0 microampere. The charge rate is not shown in this display. Instead, it is found in the Nominal Capacitance and Charge Rate screen.

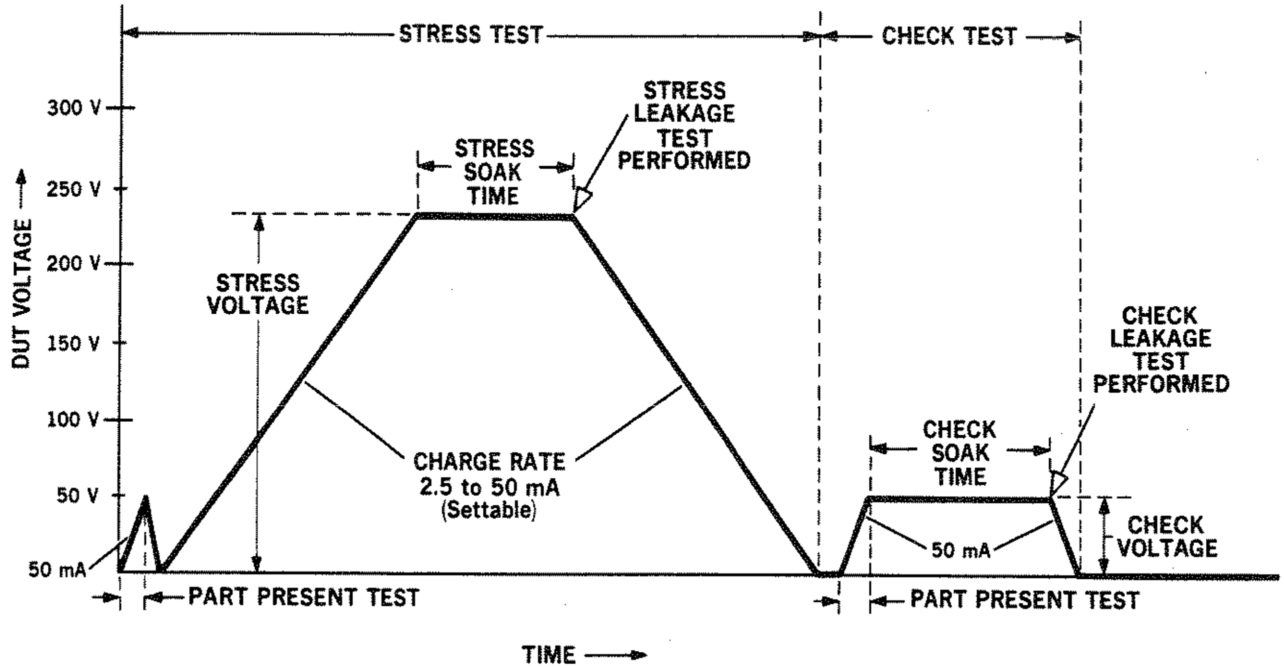


Figure 3-42. Flash Test Sequence

3.4.3.2 Check Test Screen

Figure 3-43 is provided as an example of the Check test screen as displayed on the 20-character display. This screen is reached by pressing the DOWN pushbutton while viewing the Stress test screen.

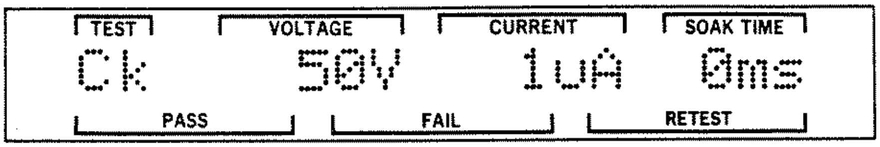


Figure 3-43. Check Test Screen

The Check test screen displays the three test conditions for the Check test: voltage, leakage current, and soak time, as indicated by the labels above the display. The Check test follows the same sequence as the Stress test (as shown in Figure 3-42), using the Check test conditions. A DUT that conducts more than the Check leakage current at the end of the Check soak time is a Check test failure. The Check test is performed to check if the DUT was damaged during the discharge portion of the Stress test. It is performed at a lower voltage than the Stress test to minimize the risk of damaging the DUT. Both Part Present tests are performed at the Check test voltage.

> **NOTE:** Setting a Check test voltage of 0 volts will cause the Check test to be skipped. The Part Present test (at the start of the Stress test) will be performed at 50 volts in this case.

The "Ck" at the left end of the display indicates that this is the Check test screen. The test voltage in this example is 50 volts. The soak time is indicated as 0 milliseconds. The leakage current is indicated as 1 microampere. Since the entire charge portion of the Check test is performed at a 50 milliampere rate, the Charge Rate value is not used.

3.4.3.3 <u>Nominal Capacitance and Charge Rate Screen</u>

Figure 3-44 is provided as an example of the Nominal Capacitance and Charge Rate screen as displayed on the 20-character display. This screen is reached by pressing the DOWN pushbutton when viewing the Check test screen.

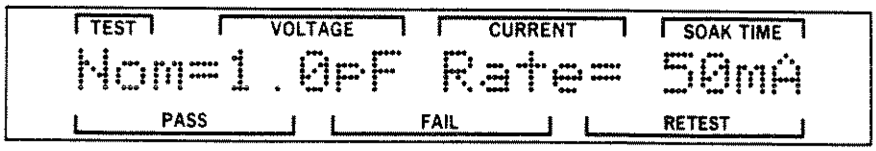


Figure 3-44. Nominal Capacitance and Charge Rate Screen

For this screen, the labels above and below the display are ignored. The characters in this example indicate that the Nominal Capacitance is 1.0 picofarad and the Charge Rate is 50 milliamperes. The Nominal Capacitance is used by the 5300 in some of its internal calculations. This value should be set to the available value that is nearest to the actual nominal value of the DUT.

The Charge Rate setting determines the rate at which the 5300 will attempt to charge and discharge the DUT during the Stress test. If the DUT capacitance is very low (relative to internal and external stray capacitances), the instrument may not be able to provide the selected current to the DUT. The expected values (that takes this limitation into account) of DUT current during the Stress and Check tests can be read in one of the Detail screens.

3.4.3.4 Presence Calibration Screen

Figure 3-45 is provided as an example of the Presence Calibration screen as displayed on the 20-character display. This screen is reached by pressing the DOWN pushbutton when viewing the Nominal Capacitance and Charge Rate screen.

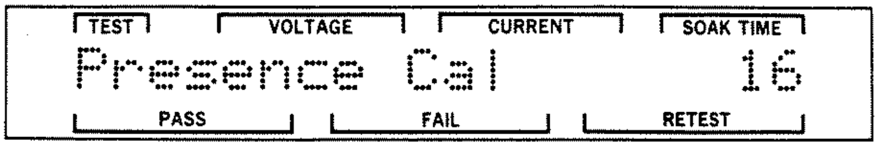


Figure 3-45. Presence Calibration Screen

This screen displays the Presence calibration value. The calibration is available only from the Set mode. This calibration corrects for the amount of capacitance between the test probes and is used by the Part Present tests. For information on performing this calibration, refer to Presence Calibration, Section 3.4.4.2.

3.4.3.5 Printer Output Screens

Figure 3-46 is provided as an example of the Printed Reports Entry screen. This screen provides access to the individual Printer Output screens. This screen is displayed after pressing the DOWN pushbutton when viewing the Presence Calibration screen.

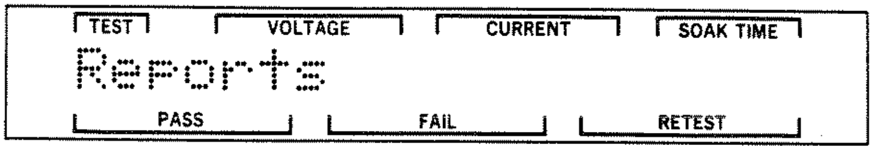


Figure 3-46. Printed Reports Entry Screen

There are three types of immediate printer output that can be selected through the Printer Output screens: Header, Bin Count Totals, and Detailed Bin Count Totals. Each of these is enabled through its own screen. In addition, a fourth screen allows automatic output of Bin Count totals after a selected number of tests. When in the Enable mode, this fourth screen can be read, but not changed. These individual screens are accessed by pressing the RIGHT pushbutton when the Printed Reports Entry screen is displayed. The following sections describe these screens.

> **NOTE:** If no printer interface has been selected under the Printer screen (Configure mode), the RIGHT LED will **not** be illuminated, indicating that the individual Printer Output screens are not accessible.

3.4.3.5.1 Print Header Screen

The Print Header screen is part of the individual Printer Output screens. These screens are displayed by pressing the RIGHT pushbutton when the Printed Reports Entry screen is displayed, followed by UP or DOWN pushbuttons. Figure 3-47 is an example of this screen.

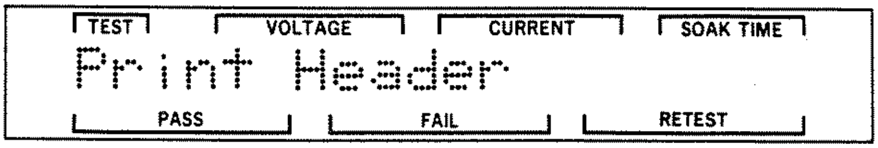


Figure 3-47. Print Header Screen

Once this screen is displayed, the Header is sent to the printer by pressing the RIGHT pushbutton. Figure 3-48 is an example of the Header.

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test    Test Voltage    Test Current    Soak Time    Calculated Rate
St      100V            20uA            0ms          50mA
Ck      50V             5uA             0ms          50mA
Nominal C= 1.0nF        Charge Rate= 50mA
Max V= 1250V            Presence Cal= 16     Output Every Nth= 1000
St Stray Cal= 270pF     Ck Stray Cal= 470pF  HV Clamp Cal= 250
```

Figure 3-48. Header Output

The first part of the Header consists of instrument identification. The letter and number at the end of this line indicates the revision of the instrument.

The next part of the Header indicates the Stress and Check test conditions. The voltage, leakage current, soak time, and calculated DUT current are shown.

The last part of the Header indicates the Nominal Capacitance, Charge Rate, Maximum Voltage, Stray Capacitanace calibration value, and Presence calibration value.

3.4.3.5.2 Print Bin Count Totals Screen

The Print Bin Count Totals screen is part of the individual Printer Output screens. These screens are displayed by pressing the RIGHT pushbutton when the Printer Output Entry screen is displayed, followed by UP or DOWN pushbuttons. Figure 3-49 is an example of this screen.

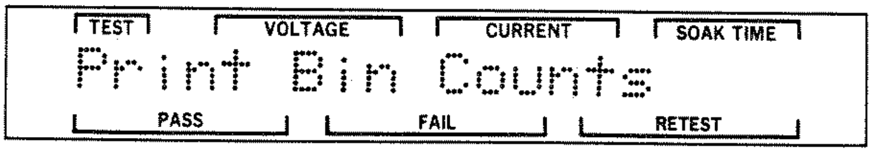


Figure 3-49. Print Bin Count Totals Screen

Once this screen is displayed, the Bin Count totals are sent to the printer by pressing the RIGHT pushbutton. Figure 3-50 is an example of the Bin Count totals.

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test    Test Voltage    Test Current    Soak Time    Calculated Rate
St      100V            20uA            0ms          50mA
Ck      50V             5uA             0ms          50mA
Nominal C= 1.0nF        Charge Rate= 50mA
Max V= 1250V            Presence Cal= 16      Output Every Nth= 1000
St Stray Cal= 270pF     Ck Stray Cal= 470pF   HV Clamp Cal= 250

Pass=     449  Fail=      37  Retest=       9  Total Tests=     495
```

Figure 3-50. Bin Count Totals Output

The Bin Count totals indicate the number of capacitors that have had the following results: Pass, Fail, and Retest. The last number is the total number of tests performed, which is equal to the sum of the first three numbers. The pass, fail, and retest numbers are the same as those displayed on the Bin Count Totals screen.

> **NOTE:** The Bin Count totals are shown on the display with 6 digits, but are printed with up to 8 digits. If a value of 999,999 is exceeded, the left-hand digit (on the display) will be replaced by a ? to indicate this overflow.

3.4.3.5.3 Print Detailed Bin Count Totals Screen

The Print Detailed Bin Count Totals screen is part of the individual Printer Output screens. These screens are displayed by pressing the RIGHT pushbutton when the Printer Output Entry screen is displayed, followed by UP or DOWN pushbuttons. Figure 3-51 is an example of this screen.

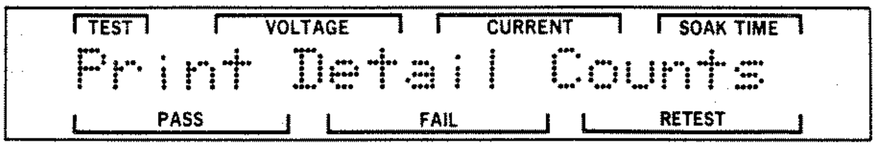


Figure 3-51. Print Detailed Bin Count Totals Screen

Once this screen is displayed, the Detailed Bin Count totals are sent to the printer by pressing the RIGHT pushbutton. Figure 3-52 is an example of the Detailed Bin Count totals.

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test     Test Voltage      Test Current     Soak Time     Calculated Rate
St       100V              20uA             0ms           50mA
Ck       50V               5uA              0ms           50mA
Nominal C= 1.0nF           Charge Rate= 50mA
Max V= 1250V               Presence Cal= 16     Output Every Nth= 1000
St Stray Cal= 270pF        Ck Stray Cal= 470pF  HV Clamp Cal= 250

Pass=     4446  Fail=     479  Retest=      75  Total Tests=    5000

Pass=                      4446
St Open=                     53
Ck Open=                     19
Short=                       16
St Ramp=                     32
Ck Ramp=                     12
St Fail=                    257
Ck Fail=                    116
Arc Presence=                13
Arc St Up=                   16
Arc St Soak=                  7
Arc St Down=                  2
Arc Ck Up=                    4
Arc Ck Soak=                  2
Arc Ck Down=                  2
Cancel Interlock=             1
Cancel Abort=                 0
Cancel Zero Volts=            0
Cancel ESD=                   0
Refuse Interlock=             2
Refuse Zero Volts=            0
Refuse HV Clamp=              0
Refuse High Temp=             0
Refuse ESD=                   0
```

Figure 3-52. Detailed Bin Count Totals Output

The detailed Bin Count totals provide a summary of test results, with each type of failure listed separately. In the standard Bin Count totals, the individual failures are counted either as Retest or as Fail. Table 3-1 describes the meaning of each of the categories.

Table 3-1. Detailed Bin Count Totals Definitions

Name	Description
Pass (Pass)	Number of components that pass all tests
Stress Open (Retest)	DUT was open during Part Present test at start of Stress test
Check Open (Retest)	DUT was open during Part Present test at start of Check test
Short (Fail)	DUT was shorted in Part Present test at start of Stress test
Stress Ramp (Fail)	DUT did not reach the Stress voltage within the appropriate time
Check Ramp (Fail)	DUT did not reach the Check voltage within the appropriate time
Stress Fail (Fail)	DUT current exceeded limit (Stress leakage current) at the end of the Stress soak time
Check Fail (Fail)	DUT current exceeded limit (Check leakage current) at the end of the Check soak time
Arc Presence (Fail)	DUT arced during a Part Present test
Arc Stress Up (Fail)	DUT arced during the charge portion of the Stress test
Arc Stress Soak (Fail)	DUT arced during the soak portion of the Stress test
Arc Stress Down (Fail)	DUT arced during the discharge portion of the Stress test

Table 3-1. Detailed Bin Count Totals Definitions (Continued)

Name	Description
Arc Check Up (Fail)	DUT arced during the charge portion of the Check test
Arc Check Soak (Fail)	DUT arced during the soak portion of the Check test
Arc Check Down (Fail)	DUT arced during the discharge portion of the Check test
Cancel Interlock (Retest)	The interlock opened after the test had begun, cancelling the test
Cancel Abort (Retest)	Device that initiated test terminated it before completion
Cancel Zero Volts (Retest)	An internal error occurred, not allowing the DUT to discharge completely, cancelling the test and not allowing further operation
Cancel ESD (Retest)	An electrostatic discharge occurred, cancelling the test
Refuse Interlock (Retest)	The interlock was open when the START request was received, preventing a test
Refuse Zero Volts (Retest)	There was a Zero Volts error prior to receiving the START request, preventing any further testing
Refuse HV Clamp (Retest)	There was a HV Clamp error prior to receiving the START request, preventing any further testing
Refuse Hi Temp (Retest)	The internal temperature of the instrument was too high when the START request was received, preventing a test
Refuse ESD (Retest)	Instrument was recovering from an electrostatic discharge when the START request was received

3.4.3.5.4 Output Every Nth Screen

The 5300 can be set to print the Bin Count totals after a specified number of tests have occurred. This is referred to as the Output Every Nth, where N is the number of tests that must occur before the Bin Count totals are sent to the printer. For example, if 1000 is selected for N, Bin Count totals will be sent to the printer after 1000, 2000, 3000, etc. tests have been performed. The following values can be set for N: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, and 10000.

The Output Every Nth screen is part of the individual Printer Output screens. These screens are displayed by pressing the RIGHT pushbutton when the Printer Output Entry screen is displayed, followed by UP or DOWN pushbuttons. Figure 3-53 is an example of this screen.

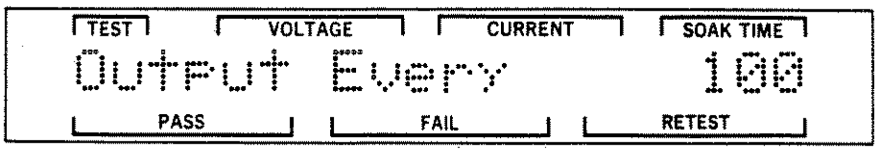


Figure 3-53. Output Every Nth Screen

When in the Enable mode, the value for N can be read, but not changed. To change the value for N, the Set mode must be used.

Figure 3-54 is an example of the output produced when N is set to 1000.

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test   Test Voltage    Test Current    Soak Time    Calculated Rate
St     100V            20uA            0ms          50mA
Ck     50V             5uA             0ms          50mA
Nominal C= 1.0nF       Charge Rate= 50mA
Max V= 1250V           Presence Cal= 16     Output Every Nth= 1000
St Stray Cal= 270pF    Ck Stray Cal= 470pF  HV Clamp Cal= 250

Pass=    901  Fail=    79  Retest=     20  Total Tests=   1000
Pass=   1762  Fail=   207  Retest=     31  Total Tests=   2000
Pass=   2651  Fail=   307  Retest=     42  Total Tests=   3000
Pass=   3539  Fail=   395  Retest=     66  Total Tests=   4000
Pass=   4446  Fail=   479  Retest=     75  Total Tests=   5000
```

Figure 3-54. Output Every Nth Output

3.4.3.6 Bin Count Totals Screen

Figure 3-55 is provided as an example of the Bin Count Totals screen as displayed on the 20-character display. This screen is reached by pressing the DOWN pushbutton when viewing the Printed Reports Entry screen. This screen also provides access to the Detail screens.

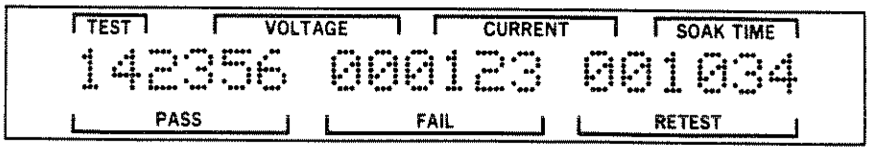


Figure 3-55. Bin Count Totals Screen

The labels below the display indicate the condition specified by each number. In this example, the first number indicates that 142,356 parts have passed the Stress and Check tests. The second number indicates that 123 parts have failed the Stress test or Check test, including parts that have ARCed or were SHORTed. The third number indicates that 1034 parts should be RETESTed. The parts in the last category cannot be judged good or bad as a system error occurred while they were being tested or the parts failed the Part Present test. Failing the Part Present test indicates that a part was open or missing, or that there was a problem in the probes or Test cable assembly.

The Bin Count totals are maintained until they are reset to 0. For information on resetting these values, refer to Resetting the Bin Count Totals, Section 3.4.4.3.

> **NOTE:** The Bin Count totals are shown on the display with 6 digits, but are printed with up to 8 digits. If a value of 999,999 is exceeded, the left-hand digit (on the display) will be replaced by a ? to indicate this overflow.

3.4.3.7 Detail Screens

The Detail screens are accessed by pressing the RIGHT pushbutton when the Bin Count Totals screen is displayed. These screens provide the following information: Calculated Stress DUT Current, Calculated Check DUT Current, Bin Count Totals Reset, and Detailed Bin Count Totals. Each of these screens is accessed by pressing the UP or DOWN pushbuttons once any one of them is displayed. The following sections describe these screens.

3.4.3.7.1 Calculated DUT Current Screens

At low DUT capacitances (relative to the stray capacitance), the 5300 may not be able to provide the selected Charge Rate to the DUT. The 5300 is able to calculate what the actual Charge Rate will be. The result of this calculation can be seen on the Calculated Stress DUT Current screen and on the Calculated Check DUT Current screen. Figure 3-56 is an example of one of these screens.

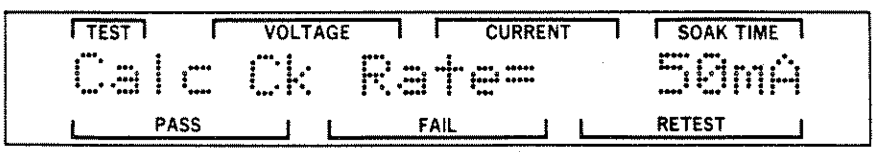


Figure 3-56. Calculated Check DUT Current Screen

3.4.3.7.2 Bin Count Totals Reset Screen

Figure 3-57 is an example of the Bin Count Totals Reset screen. It can be displayed by pressing the DOWN pushbutton when the Calculated Check DUT Current screen is displayed. When in the Set mode, it allows the Bin Count totals to be reset to 0 (by pressing the RIGHT pushbutton). It has no function in the Enable mode.

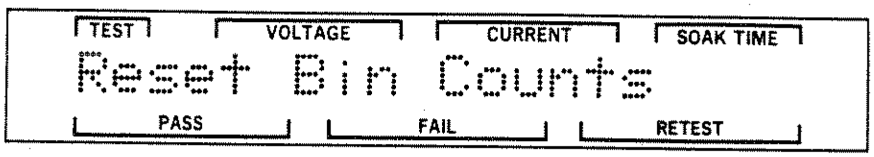


Figure 3-57. Bin Count Totals Reset Screen

3.4.3.7.3 Detailed Bin Count Totals Screens

There is a series of screens that is reached by pressing the DOWN pushbutton when the Bin Count Totals Reset Screen is displayed. These screens indicate the Bin Count totals in greater detail than the normal Bin Count Totals screen. These screens are referred to as the Detailed Bin Count Totals.

These totals are the same as can be sent to the printer. For information regarding the individual totals, refer to Print Detailed Bin Count Totals Screen, Section 3.4.3.5.3.

3.4.3.7.4 Returning to Bin Count Totals Screen

To return to the Bin Count Totals screen from any of the Detail screens, press the LEFT pushbutton.

3.4.4 Set Mode

The Set mode differs from the Enable mode in that it allows the user to view and change the values. It does **not** allow viewing or changing the communication parameters, calibration values, or Maximum Voltage. Remote devices connected through a communication interface are allowed to read test conditions, but neither such remote devices nor devices connected to the Handler Interface are allowed to initiate testing or gain control while the 5300 is in the Set mode.

The Set mode is entered by turning the access keyswitch to the SET position. Unless the 5300 is under control of a remote device (indicated by the REMOTE LED being illuminated), the 5300 will enter the Set mode and illuminate the SET LED.

Figure 3-58 is provided to indicate the "location" of each of these screens relative to one another.

There are two changes between this screen diagram and the one for the Enable mode: Change screens have been added to the right of the Stress Test, Check Test, and Nominal Capacitance and Charge Rate screens, and Output Every Nth has changed to Output Number (a sub-menu of Printed Reports Entry screen).

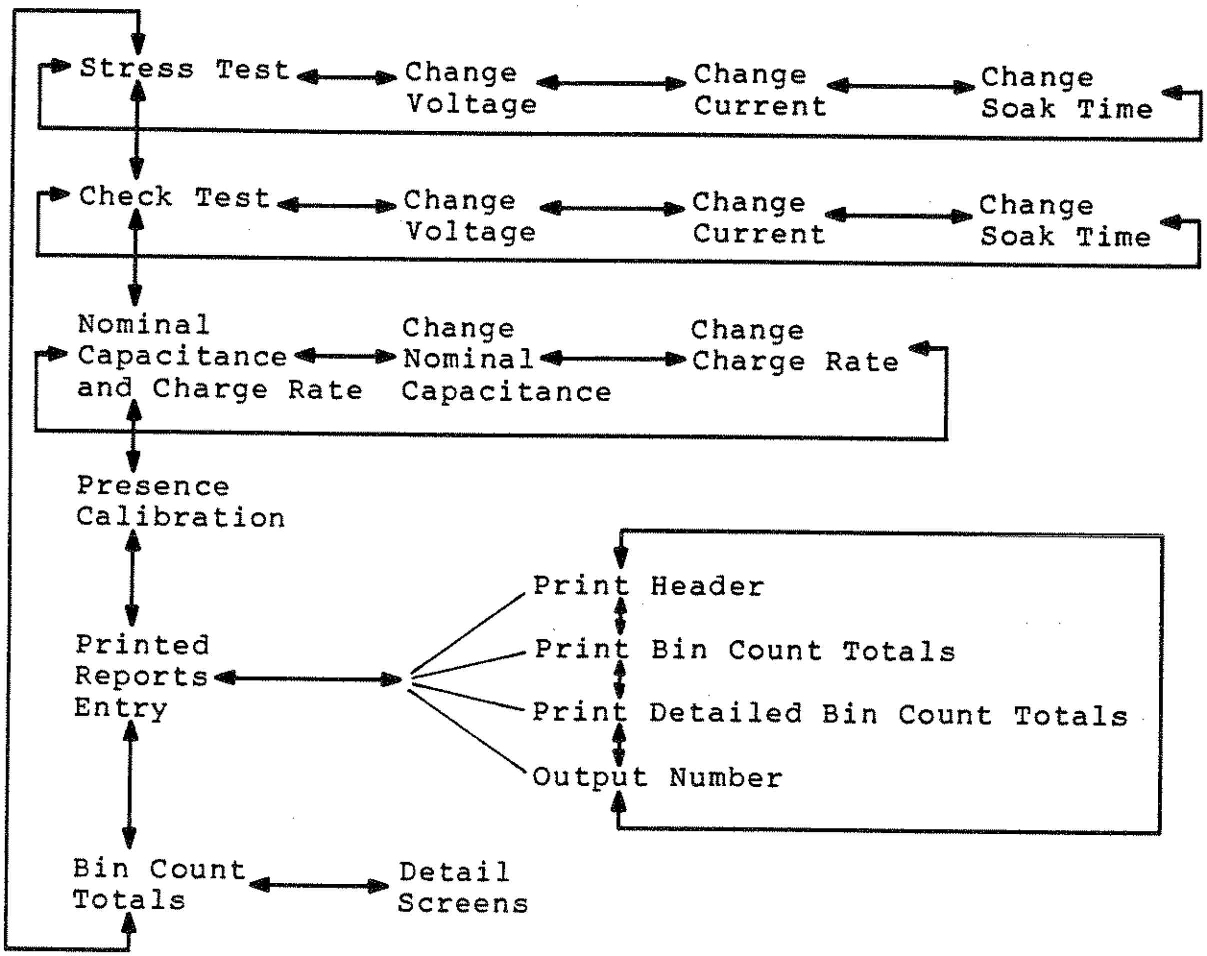


Figure 3-58. Set Mode Screen Diagram

3.4.4.1 Changing Displayed Values

The Set mode allows the displayed values to be changed through the use of the pushbuttons. The UP and DOWN pushbuttons are used to display the set of values to be changed. The RIGHT and LEFT pushbuttons are used to select the particular parameter (of the set) to be changed. The INC and DEC pushbuttons are used to actually change the value.

Changing displayed values follows the same pattern for all screens, except for the Presence Calibration and Bin Count Totals screens. For information on changing the values in these screens, refer to Presence Calibration, Section 3.4.4.2 and refer to Resetting the Bin Count Totals, Section 3.4.4.3.

For this example, the Stress test conditions will be changed, although the technique applies to the other screens as well. The following steps describe this procedure.

> **NOTE:** Neither test conditions nor handler parameters may be changed unless the Bin Count totals are all 0. For information on resetting these values, refer to Resetting the Bin Count Totals, Section 3.4.4.3.

STEP 1. Display the Stress Test screen by pressing the UP or DOWN pushbuttons until "St" appears at the left side of the display. Refer to Figure 3-59.

STEP 2. Turn the access keyswitch to the SET position to enter the Set mode. The front panel should appear as shown in Figure 3-59, although different numbers may appear in the display.

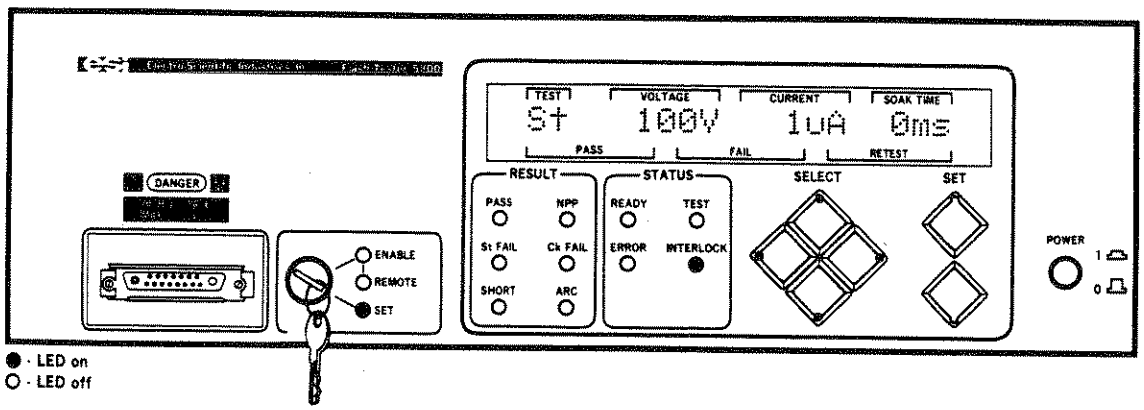


Figure 3-59. Set Mode Display

STEP 3. Press the RIGHT pushbutton to select the Voltage for changing. Observe that the display blanks, except for St and the Voltage value. This indicates that this value has been selected for changing. Notice also that the LEDs on the INC and DEC pushbuttons illuminate to indicate that the value displayed can be changed. Refer to Figure 3-60.

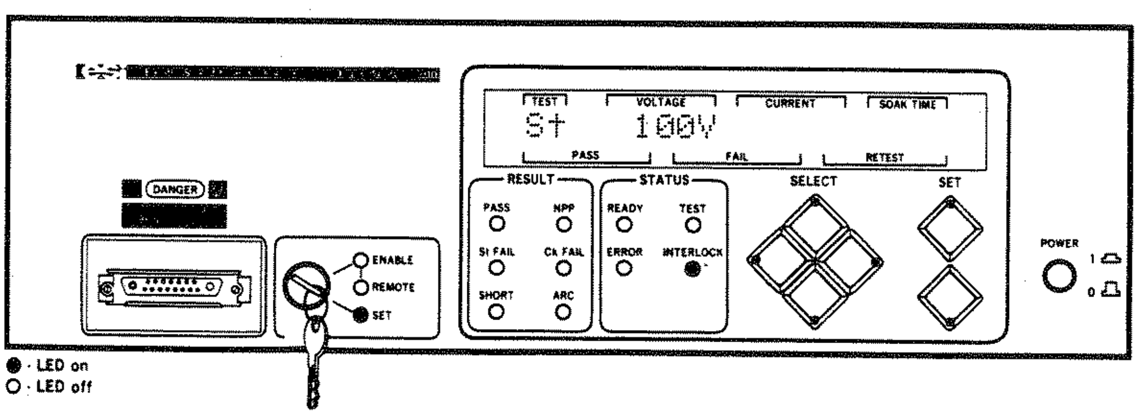


Figure 3-60. Selecting the Test Voltage

STEP 4. Press the INC or DEC pushbutton and notice that the Voltage changes. Hold either pushbutton down and notice that the value continues to change, slowly at first, then faster as the pushbutton is held down longer. Eventually, the maximum or minimum value is reached and the value will not change further. When maximum value is reached, the INC LED will no longer be illuminated. When the minimum value is reached, the DEC LED will no longer be illuminated.

STEP 5. Press the INC or DEC pushbuttons until the desired Voltage is selected.

STEP 6. Press the RIGHT pushbutton twice to skip the Leakage Current setting and display the Soak Time. Refer to Figure 3-61 for an illustration of this condition.

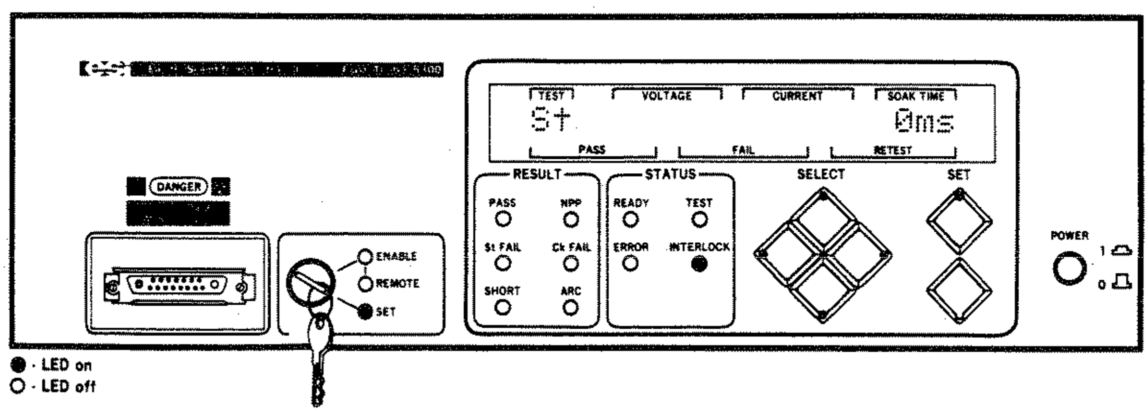


Figure 3-61. Selecting the Soak Time

STEP 7. Press the INC or DEC pushbuttons to change the Soak Time.

STEP 8. When the desired Soak Time has been selected, press the RIGHT pushbutton once or press the LEFT pushbutton three times to return to the Stress test screen. Refer to Figure 3-62.

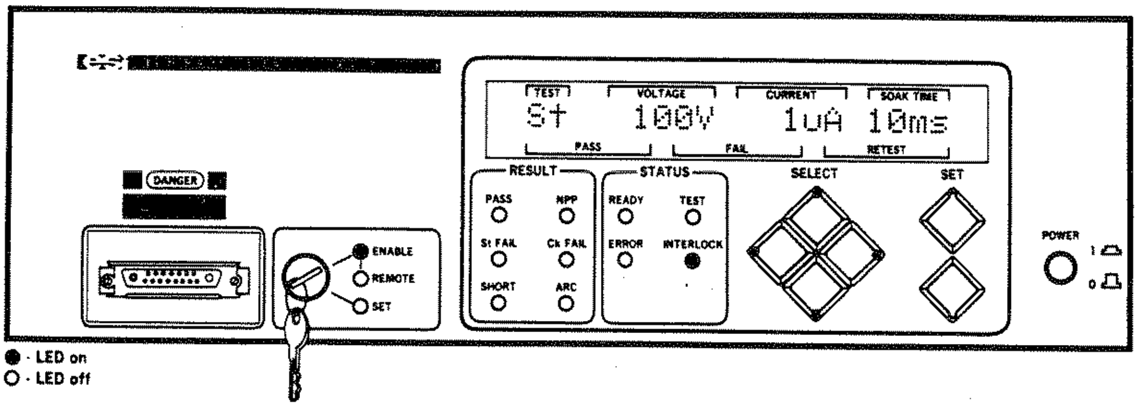


Figure 3-62. Stress Test Display

3.4.4.2 Presence Calibration

Figure 3-63 is provided as an example of the Presence Calibration screen as displayed on the 20-character display. This screen is reached by pressing the DOWN pushbutton when viewing the Nominal Capacitance and Charge Rate screen.

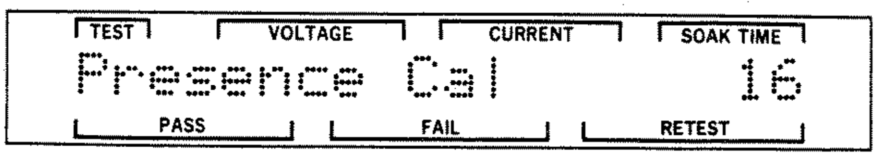


Figure 3-63. Presence Calibration Screen

This screen displays the Presence calibration value and, when in the Set mode, allows a Presence calibration to be performed. This calibration corrects for the amount of capacitance between the test probes and is used by the Part Present tests. It should be performed when the test fixture or Check voltage are changed.

This calibration allows the instrument (during the Part Present test) to detect an 0.8 picofarad DUT in the presence of up to about 10 picofarads of probe-to-probe capacitance. Since the calibration value is dependent on the amount of probe-to-probe capacitance, it should be checked any time that this capacitance could change. For this reason, the calibration should be performed whenever the test fixture is changed. A sample capacitor of the smallest value that would be tested in this test fixture is required for this calibration.

If the DUT capacitance is much greater (10 picofarads or more) than the probe-to-probe capacitance, this calibration is much less critical. In this case, experimentation may indicate that the calibration does not need to be performed with each test fixture change.

The Presence calibration consists of conducting a series of Part Present tests at different calibration values, determining the threshold where the probe-to-probe capacitance is no longer detected as a DUT, and setting a somewhat higher calibration value. As the Part Present test is performed at the Check voltage, it is essential that this voltage is set before the Presence calibration is performed.

Increasing the calibration value above the threshold value assures that a slight increase of probe-to-probe capacitance (or noise induced into the 5300) will not cause false Part Present readings. This increase represents the amount of DUT capacitance that must be exceeded for the 5300 to detect its presence.

The calibration value at the threshold is a rough measure of the probe-to-probe capacitance. At a Check voltage of 50 volts, each count of this calibration value represents about 0.04 picofarad. At 25 volts, each count is about 0.08 picofarad. For a small DUT (a few picofarads), the calibration value should be increased about 12 counts at 50 volts or about 6 counts for 25 volts. For larger DUT values, the calibration value increase can be proportionally larger. If the increase is too small, external noise will affect the Part Present test. If the increase is too large, very small DUTs may not be detected.

This calibration is performed as follows.

STEP 1. Press the POWER pushbutton to turn the 5300 to 1 (on). Allow the instrument at least 10 minutes warm-up time before performing the remainder of this procedure.

STEP 2. Enter the SET mode by turning the access keyswitch to the SET position. The SET LED next to the access keyswitch should illuminate. If the REMOTE LED is illuminated, a remote device has control of the system. The remote device must give up control before this calibration can proceed. Refer to PROGRAMMING, Section 3.9.

STEP 3. Before the Check Voltage or the Nominal Capacitance can be changed, the Bin Count totals must be set to 0. Press the DOWN pushbutton until the Bin Count Totals screen is displayed. Refer to Figure 3-64.

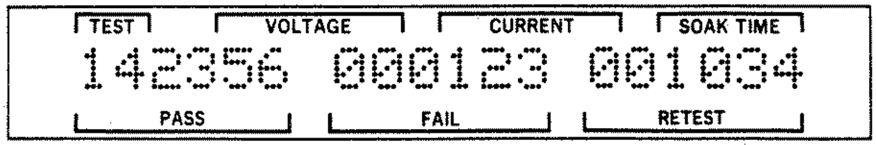


Figure 3-64. Bin Count Totals Screen

STEP 4. Press the RIGHT pushbutton to enter the Detail screens. Press the UP or DOWN pushbutton until the Reset Bin Count Totals screen is displayed. Refer to Figure 3-65.

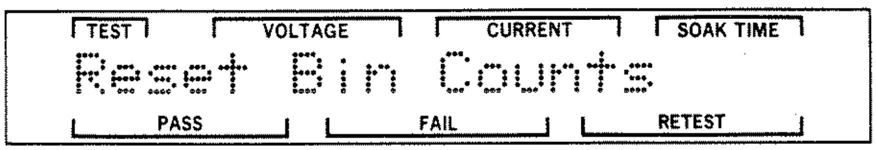


Figure 3-65. Reset Bin Count Totals Screen

STEP 5. Reset the totals to 0 by pressing the RIGHT pushbutton. Return to the Bin Count Totals screen by pressing the LEFT pushbutton.

STEP 6. Set the Check voltage (0, 25, or 50 VDC) that will be used in normal testing. Press the UP or DOWN pushbuttons until Ck is seen at the left of the display. Press the RIGHT pushbutton once to display only the Check voltage. Press the INC or DEC pushbutton to set the desired voltage. Refer to Figure 3-66 for an example of this screen.

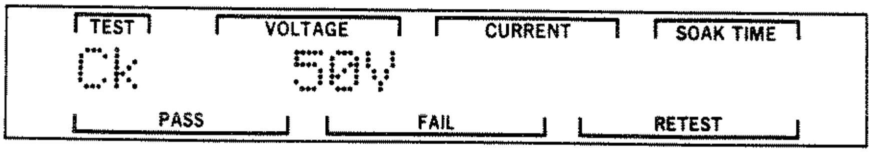


Figure 3-66. Check Voltage Screen

STEP 7. Press the LEFT pushbutton followed by the DOWN pushbutton to display the Nominal Capacitance and Charge Rate screen. Press the RIGHT or LEFT pushbutton until only the Nominal Capacitance is displayed. Press the INC or DEC pushbutton to set this to the nominal value of the sample capacitor. Refer to Figure 3-67 for an example of this screen.

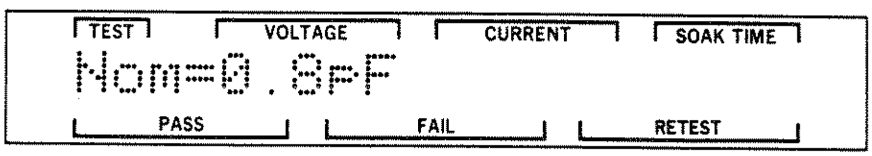


Figure 3-67. Nominal Capacitance Screen

STEP 8. Press the LEFT pushbutton once to return to the Nominal Capacitance and Charge Rate screen. Press the DOWN pushbutton to display the Presence Calibration screen. Refer to Figure 3-68 for an example of this screen.

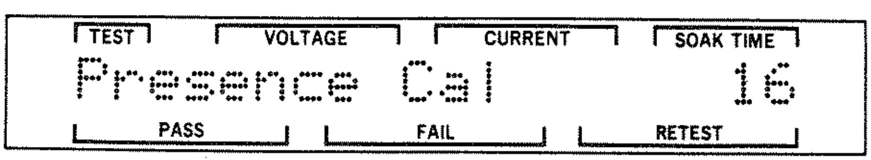


Figure 3-68. Presence Calibration Screen

STEP 9. Install the test fixture (that holds and probes the DUT) exactly as it will be used in normal testing.

STEP 10. Verify that there are no DUTs in the test fixture. Set the test fixture probes to normal spacing, **without** allowing them to contact each other.

STEP 11. Close the test head or test fixture cover. Verify that the INTERLOCK LED on the 5300 is no longer illuminated. Refer to Figure 3-69 for the location of this LED.

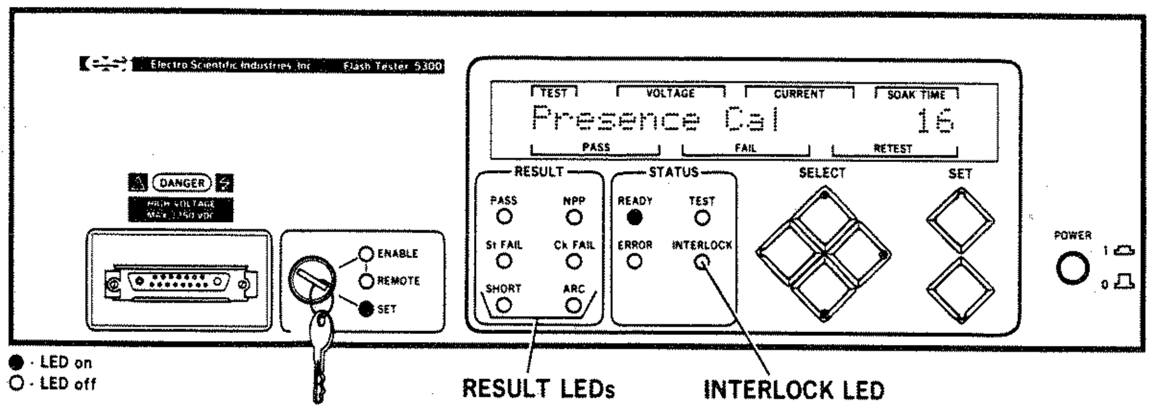


Figure 3-69. LED Locations

STEP 12. Enable the Presence calibration by pressing the RIGHT pushbutton. Initiate the Presence calibration by pressing either the INC or DEC pushbutton. A Part Present test will be performed, with the result appearing on the RESULT LEDs.

STEP 13. If the NPP (No Part Present) LED is illuminated, press the DEC pushbutton to decrease the Presence calibration value (and initiate another Part Present test). If the PASS LED is illuminated, press the INC pushbutton to increase the Presence calibration value (and initiate another Part Present test).

STEP 14. Repeat the preceding step until the test result changes from NPP to PASS or from PASS to NPP or until a calibration value of 12 is reached and NPP is still illuminated.

STEP 15. If a calibration value of 12 was reached and NPP remained illuminated, proceed to the following step.
The Presence calibration value that is now displayed is the threshold at which the probe-to-probe capacitance is no longer detected as a DUT. That is, if a higher calibration value is set, very small DUTs may not be detected as being present; if a lower calibration value is set, the probe-to-probe capacitance will be detected as a DUT. The Presence calibration value should be increased (by pressing the INC pushbutton) by 12 counts for a 50 volt Check voltage or by 6 counts for a 25 volt Check voltage. This will provide a small "guard band" to allow reliable detection of DUT presence.

STEP 16. Place the sample capacitor in the test fixture. Close the test head or test fixture cover. Verify that the INTERLOCK LED on the 5300 is no longer illuminated.

STEP 17. Press the INC pushbutton to perform another Part Present test. Press the DEC pushbutton to perform another Part Present test. In both cases, the PASS LED should illuminate to indicate that the presence of the part was detected. If the NPP LED is illuminated, either there is poor contact to the DUT, the DUT is open, or the calibration value is too high.

STEP 18. Repeat the preceding step several times to verify that the 5300 can reliably detect the presence of the DUT.

STEP 19. Press the LEFT pushbutton followed by the UP or DOWN pushbutton to leave the Presence Calibration screen. This calibration is complete.

3.4.4.3 Resetting the Bin Count Totals

Before test conditions or handler parameters can be changed, the Bin Count totals must be reset to 0. The following steps describe the procedure by which this is done.

STEP 1. With the 5300 in the Set mode (access keyswitch in the SET position and SET LED illuminated), press the DOWN pushbutton until the Bin Count Totals screen is displayed. Refer to Figure 3-70.

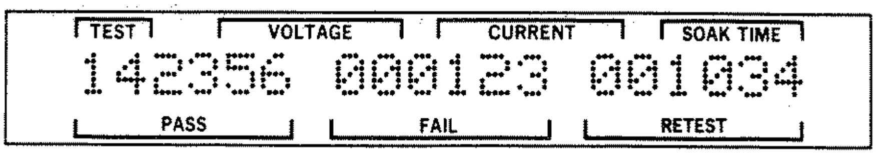


Figure 3-70. Bin Count Totals Screen

STEP 2. Press the RIGHT pushbutton to enter the Detail screens. Press the UP or DOWN pushbutton until the Reset Bin Count Totals screen is displayed. Refer to Figure 3-71.

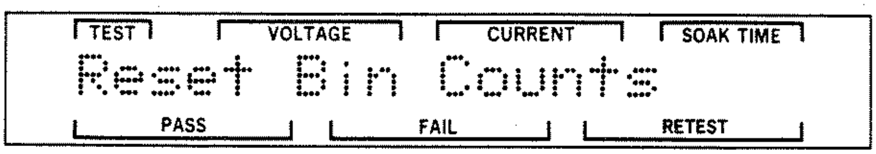


Figure 3-71. Reset Bin Count Totals Screen

STEP 3. Reset the totals to 0 by pressing the RIGHT pushbutton.

3.4.4.4 Returning to Enable Mode

When in the Set mode, returning to the Enable mode involves turning the access keyswitch to the ENABLE position. The ENABLE LED illuminates (and the SET LED turns off) to indicate that the Enable mode is active.

3.4.5 Configure Mode

The Configure mode allows values to be viewed and changed that were not possible in other modes. The Instrument Identification, Maximum Voltage, system resets, Stray and HV Clamp calibration values, Breakdown test, and communication parameters are not accessible from any other mode. Figure 3-72 is provided to indicate the "location" of each of these screens relative to one another.

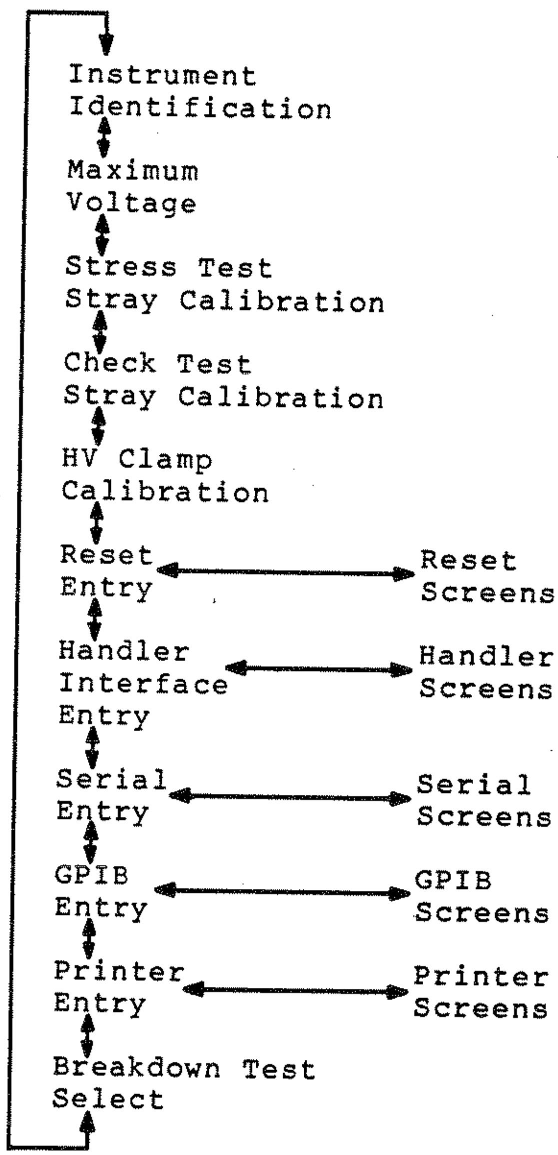


Figure 3-72. Configure Mode Screen Diagram

NOTE: The individual screens for the Handler and communication interfaces that have not been installed will not be accessible.

Each entry to the right of the Handler Interface, Serial, GPIB, and Printer Entry screens contains another series of screens. These individual screens (to the right of an Entry screen) are scrolled through by pressing the UP or DOWN pushbuttons. Pressing the LEFT pushbutton when any of these screens are displayed will return to the appropriate Entry screen.

Information on the individual Handler Screens is found in Handler Parameter Screens, Section 3.6.3. Information on the individual Serial screens is found in Serial Parameter Screens, Section 3.7.2.3. Information on the individual GPIB screens is found in GPIB Parameter Screens, Section 3.7.1.3. Information on all of the other screens is provided in the following sections.

Entering the Configure Mode is accomplished by pressing the INC and DEC pushbuttons simultaneously when the Nominal Capacitance and Charge Rate screen is displayed (in the Set mode). For more information, refer to Entering the Configure Mode, Section 3.4.5.1.

Exiting the Configure Mode is accomplished by pressing the LEFT pushbutton (several times, if necessary). The system will return to the Nominal Capacitance and Charge Rate screen in the Set mode.

3.4.5.1 Entering the Configure Mode

The Configure mode is entered from the Set mode. The Nominal Capacitance and Charge Rate screen must be displayed, then the INC and DEC pushbuttons are pressed at the same time.

The Instrument Identification screen will be displayed the first time that the Configure mode is entered after power up or a system reset. On subsequent entries into the Configure mode, the **last** screen used in the Configure mode will be displayed. For example, if the Configure mode is exited while in the GPIB Entry screen, the next time the Configure mode is entered (as long as the power has not been turned off), the GPIB Entry screen will be displayed.

The following steps describe the procedure by which the Configure mode is entered.

STEP 1. Enter the Set mode by turning the access keyswitch to the SET position. The SET LED will illuminate to indicate that the Set mode has been entered.

STEP 2. Select the Nominal Capacitance and Charge Rate screen by pressing the UP or DOWN pushbuttons until the screen is displayed. Refer to Figure 3-73.

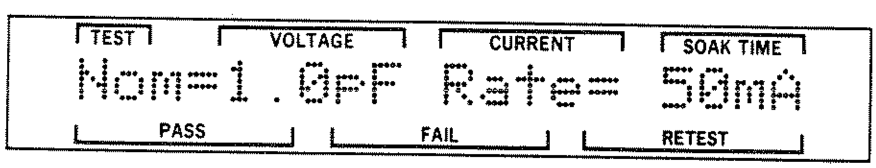


Figure 3-73. Nominal Capacitance and Charge Rate Screen

STEP 3. Enter the Configure Mode by pressing the INC and DEC pushbuttons at the same time, then releasing them. If this is the first time this mode has been entered since power up, the display should change to the Instrument Identification screen (when the INC and DEC pushbuttons are released), as shown in Figure 3-74. Press the UP or DOWN pushbutton several times to scroll through the Configure mode screens.

NOTE: Pressing the INC and DEC pushbutons in the previous step is the only instance in which pressing a pushbutton whose LED is not illuminated will have an effect.

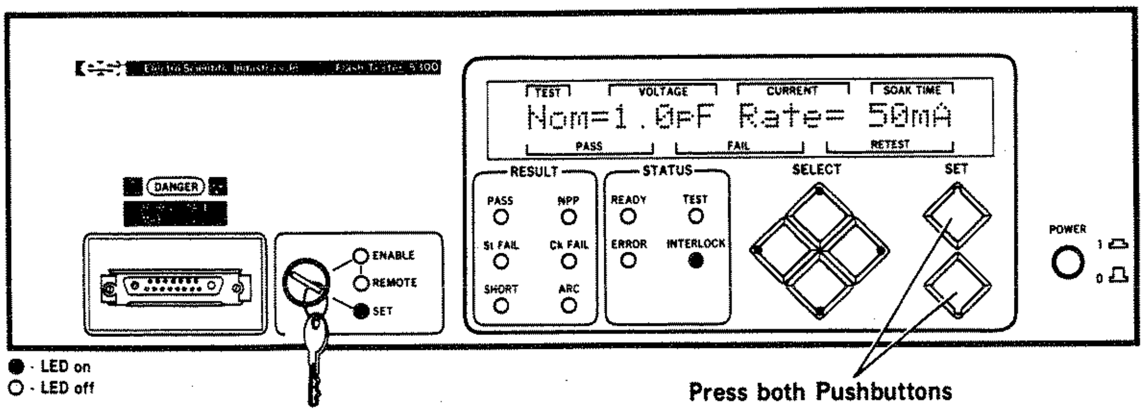


Figure 3-74. Entering the Configure Mode

3.4.5.2 Instrument Identification Screen

Figure 3-75 is an example of the Instrument Identification screen. It identifies the revision level of the hardware and software. This screen can be displayed the first time that the Configure mode is entered. It can also be displayed by pressing the DOWN pushbutton when the Printer Entry screen is displayed.

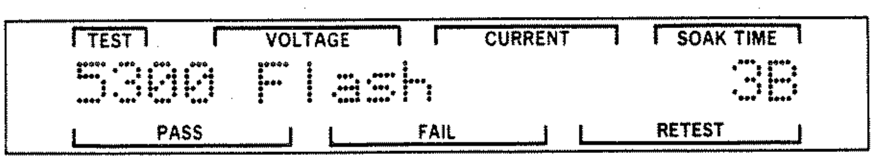


Figure 3-75. Instrument Identification Screen

3.4.5.3 Setting the Maximum Voltage

The Maximum Voltage is a voltage above which the Stress Voltage can not be set. This allows the user to set the Maximum Voltage to a value above which no testing should ever be required. Once this is done, the user cannot accidentally set the Stress Voltage (in the Set mode or remotely) to a value that exceeds this.

The Maximum Voltage is changed by pressing the INC or DEC pushbuttons once the Maximum Voltage Screen is displayed. This screen is displayed by pressing the DOWN pushbutton when the Instrument Identification screen is displayed. The Maximum Voltage can be set to any value from 50 V to 1250 V, in 50 V steps.

3.4.5.4 Reset Screens

There are three Reset screens that allow the system to be reset to predetermined values. Access to these screens is made by pressing the RIGHT pushbutton when the Reset Entry screen is displayed. Pressing the UP or DOWN pushbutton scrolls through the individual Reset screens. The Reset Entry screen is displayed by pressing the DOWN pushbutton when the High Volt Clamp Cal screen is displayed. Figure 3-76 is an example of the Reset Entry screen.

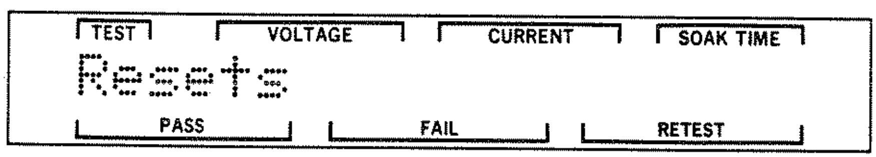


Figure 3-76. Reset Entry Screen

Each of the individual Reset screens allow different sets of values to be reset. The reset is accomplished by pressing the RIGHT pushbutton when the particular Reset screen is displayed. The following sections describe the individual screens.

3.4.5.4.1 Test Conditions Reset

The Test Conditions Reset screen changes the least number of values of all the resets. Figure 3-77 is an example of the Test Conditions Reset screen. This screen is displayed by displaying the Reset Entry screen, pressing the RIGHT pushbutton, and pressing the UP or DOWN pushbutton. Pressing the RIGHT pushbutton when this screen is displayed will perform the Test Condition Reset. Table 3-2 lists the values that are set by this function. No other values are changed.

> **NOTE:** If the Bin Count totals have not been reset to 0 before the Test Conditions Reset screen is displayed, the RIGHT pushbutton will **not** be illuminated. This indicates that the reset cannot be performed. To allow the test conditions to be reset, perform a Bin Count totals reset first. For more information, refer to Resetting the Bin Count Totals, Section 3.4.4.3.

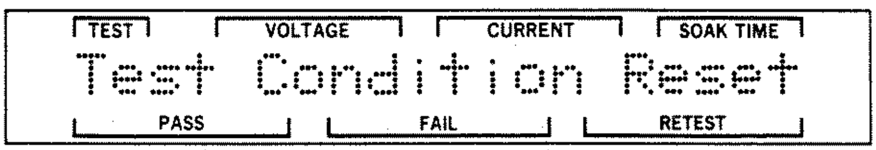


Figure 3-77. Test Conditions Reset Screen

Table 3-2. Test Conditions Reset Values

Test Condition	Value
Stress Voltage	100 V
Stress Leakage Current	1 uA
Stress Soak Time	0 ms
Check Voltage	50 V
Check Leakage Current	1 uA
Check Soak Time	0 ms
Nominal C	1.0 pF
Charge Rate	50 mA

3.4.5.4.2 Installation Reset

The Installation Reset changes all values except for the HV Clamp Calibration. Figure 3-78 is an example of the Installation Reset screen. This screen is displayed by pressing the DOWN pushbutton when the Test Conditions Reset screen is displayed. Pressing the RIGHT pushbutton when this screen is displayed will perform the Installation Reset. Table 3-3 lists the new values that are used. Tables 3-4, 3-5, and 3-6 list the new values used for the interfaces.

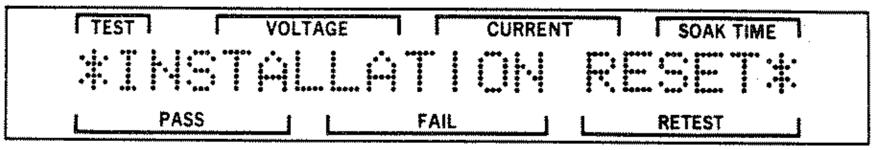


Figure 3-78. Installation Reset Screen

CAUTION

PERFORMING THIS RESET MAY CHANGE THE STRESS AND CHECK STRAY CALIBRATION AND PRESENCE CALIBRATION VALUES. AFTER THIS RESET IS PERFORMED, THESE CALIBRATIONS MUST BE PERFORMED FOR PROPER INSTRUMENT OPERATION.

Table 3-3. Installation Reset Values

Parameter	Value
Stress Voltage	100 V
Stress Leakage Current	1 uA
Stress Soak Time	0 ms
Check Voltage	50 V
Check Leakage Current	1 uA
Check Soak Time	0 ms
Nominal C	1.0 pF
Charge Rate	50 mA
Presence Calibration	16
Output Every Nth Test	N = Never
Bin Count Totals	0
Maximum Voltage	1250 V
St. Stray Calibration	270 pF
Ck. Stray Calibration	470 pF
Handler Interface	See Table 3-4
Serial Interface	See Table 3-5
GPIB Interface	See Table 3-6
Printer Interface	None

NOTE: In the following table, values in parentheses are displayed if the other value for Type or Results is selected after performing the reset. For example, if Basic is selected for Type, the Probe Fail # becomes 5.

Table 3-4. Handler Interface Reset Values

Parameter	Value	
Type	Smart	
Probe Fail #	Unused	(5)
Data Hold	9.9 s	
Results	Binary	
Pass	10000	(10000000)
St Fail	01001	(01000000)
Ck Fail	01010	(01000000)
Arc	01100	(01000000)
Short	01101	(01000000)
NPP	00110	(00100000)
Interlock	00101	(00010000)
Analog Error	00011	(00001000)

Table 3-5. Serial Interface Reset Values

Parameter	Value
Baud	9600
Char Size	8 bits
Parity	None
Stop Bits	1
Output	CR+LF
XON/XOFF	No
Printer	No

Table 3-6. GPIB Interface Reset Values

Parameter	Value
Address	Off
Input	Ignore CR
Output	None

3.4.5.4.3 Global Reset

The Global Reset performs the same function as the Installation Reset, with the addition of setting the HV Clamp Calibration. This value is set to 250 when the Global Reset is performed. Figure 3-79 is an example of the Global Reset screen. This screen is displayed by pressing the DOWN pushbutton when the Installation Reset screen is displayed. Pressing the RIGHT pushbutton when this screen is displayed will perform the Global Reset.

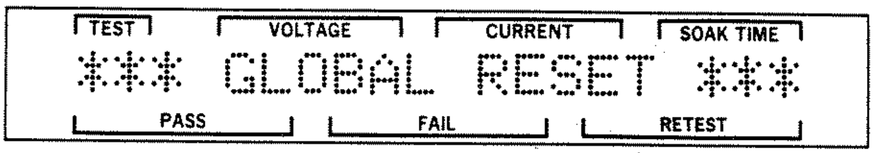


Figure 3-79. Global Reset Screen

CAUTION

PERFORMING THIS RESET MAY CHANGE THE HV CLAMP CALIBRATION, STRESS AND CHECK STRAY CALIBRATION, AND PRESENCE CALIBRATION VALUES. AFTER THIS RESET IS PERFORMED, THESE CALIBRATIONS MUST BE PERFORMED FOR PROPER INSTRUMENT OPERATION.

3.4.5.5 Stress Test Stray Calibration Screen

Figure 3-80 is an example of the Stress Test Stray Calibration screen. This screen is displayed by pressing the DOWN pushbutton when the Max Volts screen is displayed. For information regarding how and when this calibration is performed, refer to Stress and Check Stray Calibrations, Section 5.2.2.

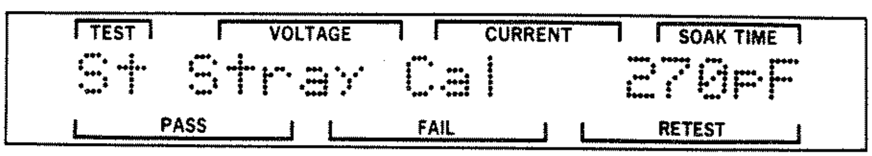


Figure 3-80. Stress Test Stray Calibration Screen

3.4.5.6 Check Test Stray Calibration Screen

Figure 3-81 is an example of the Check Test Stray Calibration screen. This screen is displayed by pressing the DOWN pushbutton when the Stress Test Stray Calibration screen is displayed. For information regarding how and when this calibration is performed, refer to Stress and Check Stray Calibrations, Section 5.2.2.

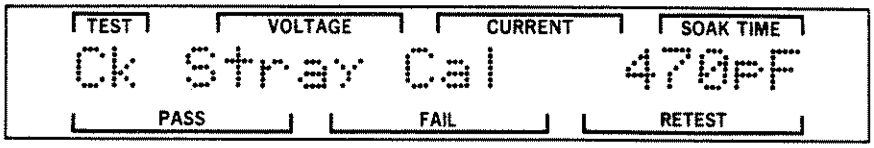


Figure 3-81. Check Test Stray Calibration Screen

3.4.5.7 HV Clamp Calibration Screen

Figure 3-82 is an example of the HV Clamp Calibration screen. This screen is displayed by pressing the DOWN pushbutton when the Check Test Stray Calibration screen is displayed. For information regarding how and when this calibration is performed, refer to HV Clamp Calibration, Section 5.2.1.

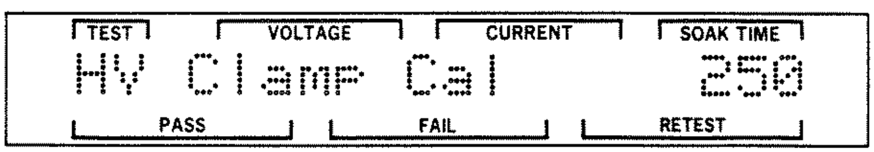


Figure 3-82. HV Clamp Calibration Screen

3.4.5.8 Breakdown Test Screen

Figure 3-83 is an example of the Breakdown Test screen. This screen is displayed by pressing the DOWN pushbutton when the HV Clamp Calibration screen is displayed.

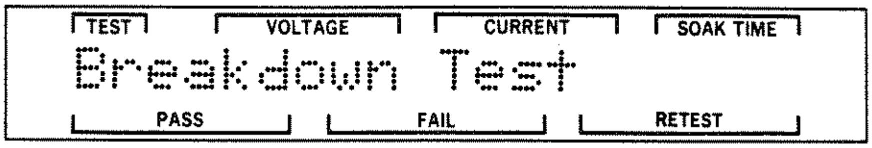


Figure 3-83. Breakdown Test Screen

This screen provides a method for initiating the (voltage) Breakdown test. The Breakdown test is provided to identify the minimum voltage at which a DUT will fail a Flash test. This test consists of a series of Flash tests performed at increasing voltages. The first test uses the selected Stress Voltage as the actual Stress voltage (maintained for the Stress soak time). The Stress voltage is increased by 10 volts for the next test and for each subsequent test. The test terminates when any of the following occurs: the LEFT pushbutton is pressed, the Maximum Voltage is reached, or the DUT fails a test.

> **NOTE:** The Check test can be disabled by selecting a Check voltage of 0 volts. In this case, the Part Present test will be performed at 50 volts.

During the Breakdown test, the display indicates the Stress voltage of the test in progress. At the end of the Breakdown test, the display indicates the last Stress voltage. The RESULT LEDs indicate the result of the last test.

If the value for the Output Every Nth screen is set to 1, a one-line result will be printed for each Breakdown test. The first test will be preceded by the standard header that indicates test conditions.

Figure 3-84 is an illustration of the DUT voltage during a Breakdown test.

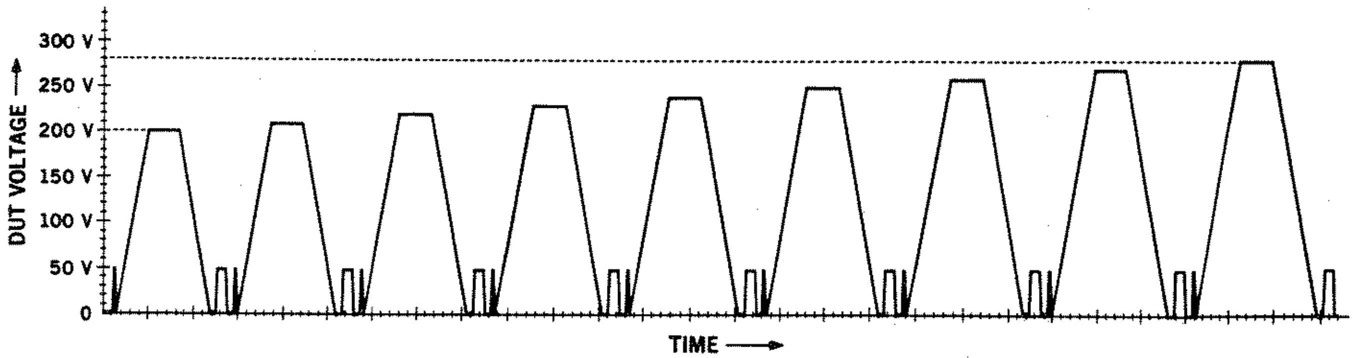


Figure 3-84. Breakdown Test Sequence

The Breakdown test is performed as follows:

STEP 1. The test conditions must be set to the desired values. Before this can be done, the Bin Count totals must be reset to 0. With the access keyswitch in the SET position, press the UP or DOWN pushbutton until the Bin Count Totals screen is displayed. If the Configure mode displays are shown, press the LEFT pushbutton (several times, if necessary) to return to the Set mode. Figure 3-85 is an illustration of the Bin Count Totals screen. If the totals are all 0, the next two steps can be skipped.

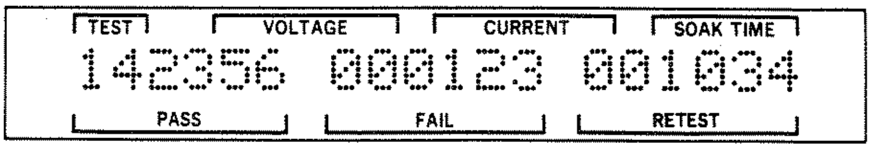


Figure 3-85. Bin Count Totals Screen

STEP 2. Press the RIGHT pushbutton to access the Detail screens. Press the UP or DOWN pushbutton until the Reset Bin Count Totals screen is displayed. Figure 3-86 is an illustration of this screen.

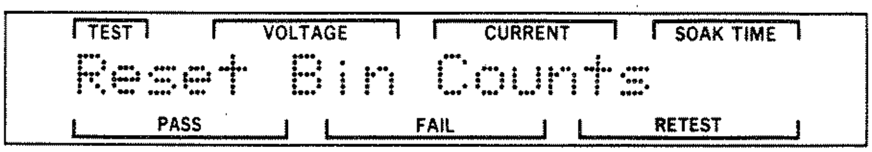


Figure 3-86. Reset Bin Count Totals Screen

STEP 3. Press the RIGHT pushbutton to reset the totals. Press the LEFT pushbutton to return to the Bin Count Totals screen.

STEP 4. Press the DOWN pushbutton to display the Stress Test screen. Figure 3-87 is an example of this screen.

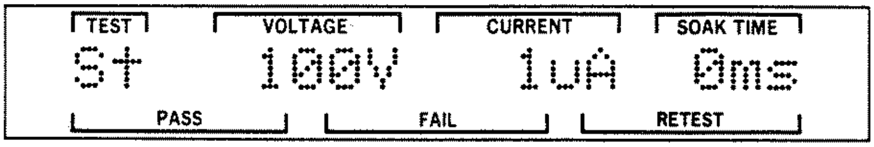


Figure 3-87. Stress Test Screen

STEP 5. Set each of the conditions (voltage, leakage current, and soak time) by pressing the RIGHT pushbutton and INC or DEC pushbutton. The value set for voltage will be the starting value for the Breakdown test.

STEP 6. Press the RIGHT or LEFT pushbutton to return to the Stress Test screen. Press the DOWN pushbutton to access the Check test conditions. Set each of the conditions as desired. If no Check test is desired, set the Check test voltage to 0.

STEP 7. Press the LEFT pushbutton (several times, if necessary) until the Check test screen is displayed. Figure 3-88 is an illustration of this screen.

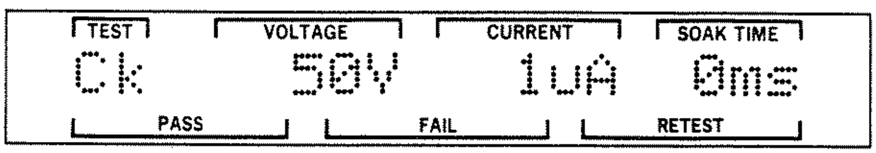


Figure 3-88. Check Test Screen

STEP 8. Press the DOWN pushbutton to display the Nominal Capacitance and Charge Rate screen. Figure 3-89 is an example of this screen. If the values need to be changed, press the RIGHT pushbutton and INC and DEC pushbutton until the desired values are shown. Press the RIGHT or LEFT pushbutton until the Nominal Capacitance and Charge Rate screen is displayed.

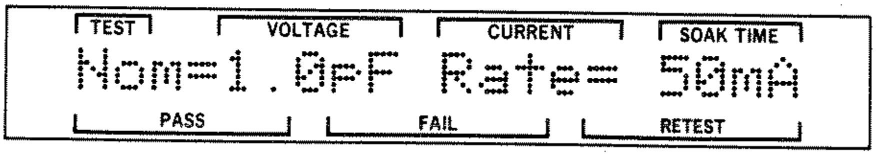


Figure 3-89. Nominal Capacitance and Charge Rate Screen

STEP 9. Press the DOWN pushbutton to display the Presence Calibration screen. If the test fixture or Check voltage has been changed since this calibration was last performed, it may need to be performed again. Refer to Presence Calibration, Section 3.4.4.2.

STEP 10. Press the DOWN pushbutton to display the Printed Report Entry screen. Figure 3-90 is an illustration of this screen.

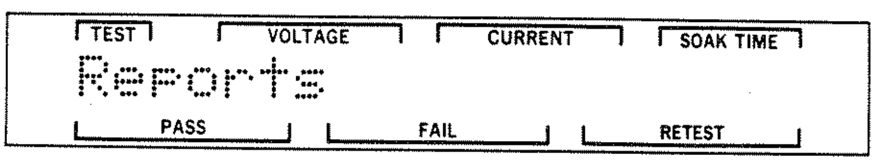


Figure 3-90. Printed Report Entry Screen

STEP 11. If the results of the Breakdown test are to be printed, a value of 1 must be set for N. If the results are not to be printed, some other value must be set. Press the RIGHT pushbutton to access the individual printer screens. Press the UP or DOWN pushbutton until the Output Number screen is displayed. Figure 3-91 is an example of this screen.

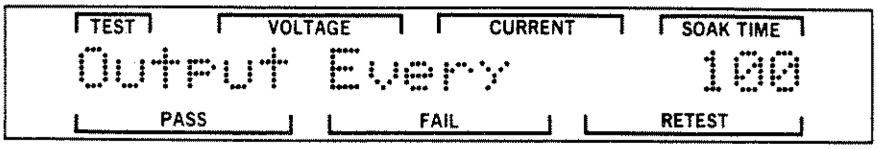


Figure 3-91. Output Number Screen

STEP 12. Press INC or DEC until the desired value (1 to allow printing, any other number to not allow printing) is shown. Press the LEFT pushbutton to return to the Printed Report Entry screen.

STEP 13. Press the UP pushbutton twice to display the Nominal Capacitance and Charge Rate screen. Press the INC and DEC pushbuttons simultaneously, then release them to enter the Configure mode.

STEP 14. Press the UP or DOWN pushbutton until the Maximum Voltage screen is displayed. Figure 3-92 is an example of this screen.

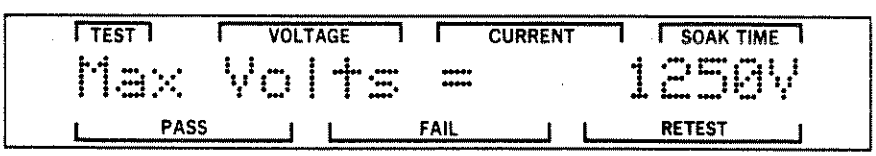


Figure 3-92. Maximum Voltage Screen

STEP 15. The maximum voltage to be used in the Breakdown test is selected at this screen. This is done by pressing the INC or DEC pushbutton until the voltage is displayed.

STEP 16. Press the DOWN pushbutton five times until the Breakdown Test screen is displayed. Figure 3-93 is an illustration of this screen.

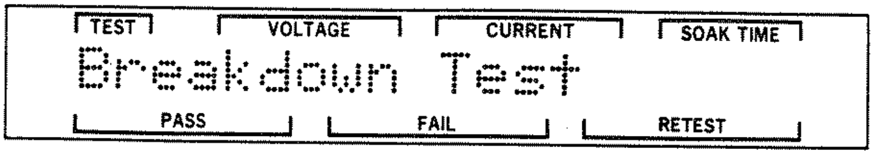


Figure 3-93. Breakdown Test Screen

STEP 17. Install the DUT into the test head and close the cover. Notice that the INTERLOCK LED on the 5300 turns off when the cover is closed. The Breakdown test is ready to begin.

STEP 18. Press the RIGHT pushbutton to initiate the Breakdown test. The display should indicate the voltage that is being used for the test in progress. This voltage starts at the selected Stress Voltage and increases in 10 volt steps to the Maximum Voltage. An example of this is shown in Figure 3-94.

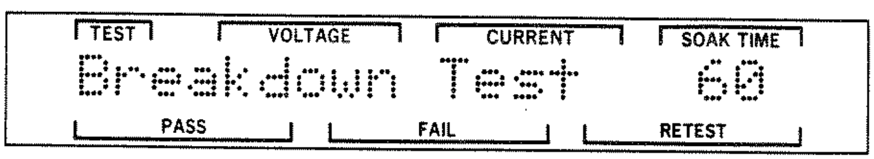


Figure 3-94. Breakdown Test in Progress Screen

STEP 19. When the test is finished, the display will indicate the last voltage tested and a RESULT LED will indicate the test result. If the PASS LED is illuminated, the test reached the Maximum Voltage without a DUT failure. If the DUT failed, the type of failure is indicated by the illuminated RESULT LED. The voltage shown in the display is the Stress voltage of the test that the DUT failed. If the Breakdown test was terminated by an error or by pressing the LEFT pushbutton, no RESULT LED will be illuminated. Figure 3-95 is an example of a display after a DUT failed at 830 volts.

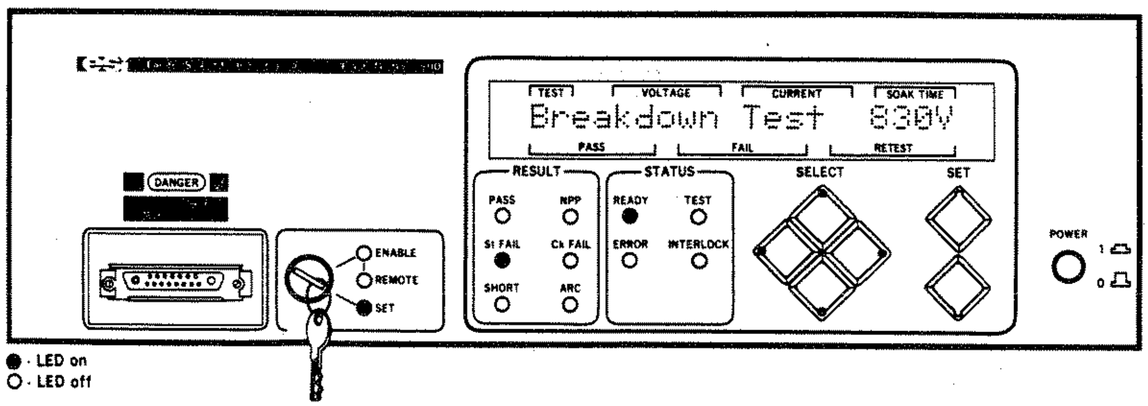


Figure 3-95. Breakdown Test Result Display

STEP 20. If printer output was enabled (by setting an N=1), a header would have been printed, followed by the test result. Subsequent Breakdown test results would be printed without the header. Figure 3-96 is an example of this printout after several tests have been performed.

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test    Test Voltage     Test Current     Soak Time     Calculated Rate
St      100V             20uA             0ms           50mA
Ck      0V               5uA              0ms           50mA
Nominal C= 1.0nF         Charge Rate= 50mA
Max V= 1250V             Presence Cal= 16        Output Every Nth= 1
St Stray Cal= 270pF      Ck Stray Cal= 470pF     HV Clamp Cal= 250

Breakdown: 1250V, Pass
Breakdown:  100V, NPP
Breakdown:  500V, ARC
Breakdown:  830V, St Fail
```

Figure 3-96. Breakdown Test Printout

3.4.5.9 Handler Interface Entry Screen

Figure 3-97 is an illustration of the Handler Interface Entry screen. It provides access to the individual Handler screens, allowing the Handler Interface to be configured to a particular application. This screen is displayed by pressing the DOWN pushbutton when the Reset screen is displayed.

> **NOTE:** If a Handler Interface is not installed or if the Bin Count totals are not all 0, the LED on the RIGHT pushbutton will **not** be illuminated, indicating that the individual Handler screens are not accessible. For information on resetting the Bin Count totals, refer to Resetting the Bin Count Totals, Section 3.4.4.3.

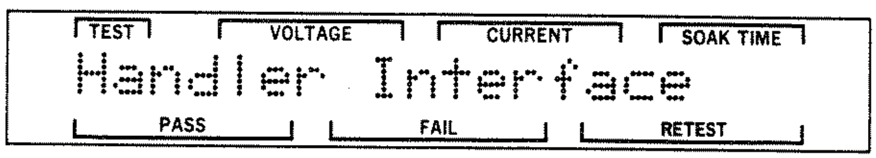


Figure 3-97. Handler Interface Entry Screen

For information regarding the individual Handler screens, refer to Handler Parameter Screens, Section 3.6.3.

3.4.5.10 Serial Interface Entry Screen

Figure 3-98 is an illustration of the Serial Interface Entry screen. It provides access to the individual Serial screens, allowing the Serial interface to be configured to a particular application. This screen is displayed by pressing the DOWN pushbutton when the Handler Interface Entry screen is displayed.

> **NOTE:** If a Serial interface is not installed or if the Serial interface is active, the individual Serial screens will not be accessible. The RS-232-C Interface is considered active when DSR is high. The RS-449 Interface is considered active when DM is high.

Figure 3-98. Serial Interface Entry Screen

For information regarding the individual Serial screens, refer to Serial Parameter Screens, Section 3.7.2.3.

3.4.5.11 GPIB Interface Entry Screen

Figure 3-99 is an illustration of the GPIB Interface Entry screen. It provides access to the individual GPIB screens, allowing the GPIB Interface to be configured to a particular application. This screen is displayed by pressing the DOWN pushbutton when the Serial Interface Entry screen is displayed.

> **NOTE:** If a GPIB Interface is not installed or if the GPIB Interface is active (REN low indicates that the interface is active), the individual GPIB screens will not be accessible.

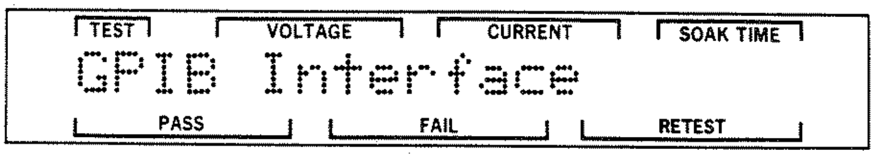


Figure 3-99. GPIB Interface Entry Screen

For information regarding the individual GPIB screens, refer to GPIB Parameter Screens, Section 3.7.1.2.

3.4.5.12 Printer Entry Screen

Figure 3-100 is an illustration of the Printer Entry screen. It provides access to the two Printer screens, which are described in the following sections. This screen is displayed by pressing the DOWN pushbutton when the GPIB Interface screen is displayed.

> **NOTE:** If no interfaces are installed or if none is selected for use with a printer, the individual Printer screens will not be accessible.

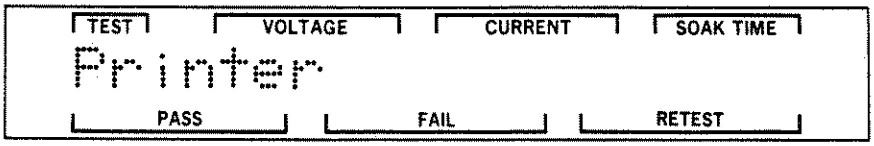


Figure 3-100. Printer Entry Screen

To access the individual Printer screens, press the RIGHT pushbutton when the Printer Entry screen is displayed.

3.4.5.12.1 Interface Select Screen

Figure 3-101 is an example of the Interface Select screen. This screen is displayed by pressing the RIGHT pushbutton (followed by the UP or DOWN pushbutton, if necessary) when the Printer Entry screen is displayed.

> **NOTE:** If no interfaces are installed or if none is selected for use with a printer, the individual Printer screens will not be accessible.

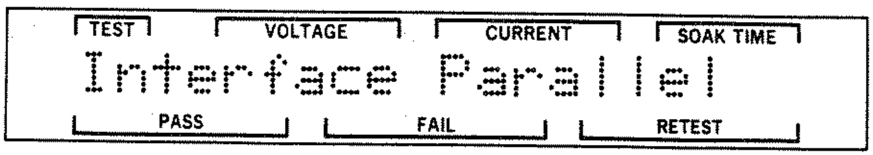


Figure 3-101. Interface Select Screen

This screen provides the means to select which interface will be used for output to the printer. Pressing the INC or DEC pushbutton scrolls through the individual choices. Only those interfaces that are installed and have been selected for use with a printer will be shown. A choice of None is available to prevent all printer output.

For information regarding configuring the GPIB interface for use with a printer, refer to Address Select Screen, Section 3.7.2.2. For information regarding configuring the Serial interface for use with a printer, refer to Interface Select Screen, Section 3.4.5.12.1. If the Parallel Interface is used with a printer, the only necessary parameter selection is Parallel at the Interface Select screen.

3.4.5.12.2 Print Configuration Screen

Figure 3-102 is an illustration of the Print Configuration screen. Pressing the RIGHT pushbutton when this screen is displayed will send all configuration information to the printer. This information includes the Header that is available from the Enable mode. Figure 3-103 is an example of such a printout.

NOTE: If no interfaces are installed or if none is selected for use with a printer, the individual Printer screens will not be accessible.

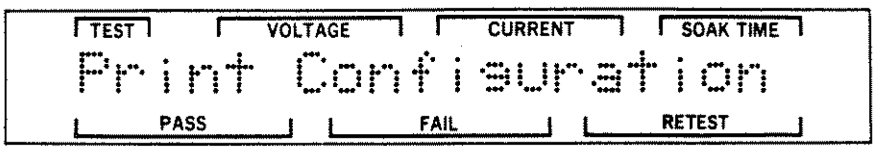


Figure 3-102. Print Configuration Screen

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test    Test Voltage      Test Current     Soak Time     Calculated Rate
St      100V              20uA             0ms           50mA
Ck      50V               5uA              0ms           50mA
Nominal C= 1.0nF          Charge Rate= 50mA
Max V= 1250V              Presence Cal= 16      Output Every Nth= 1000
St Stray Cal= 270pF       Ck Stray Cal= 470pF   HV Clamp Cal= 250

Handler Parameters:
Type= Basic               Probe Fail #= 3
Data Hold= 50ms           Results= One-of-Nine
Pass                      10000         10000000
St Fail                   01001         01000000
Ck Fail                   01010         01000000
Arc                       01100         01000000
Short                     01101         01000000
NPP                       00110         00100000
Interlock                 00101         00010000
Analog Error              00011         00001000

Serial Parameters:
Baud= 9600                Char. Size= 8 bits
Parity= None              Stop Bits= 1          Output= CR+LF
XON/XOFF= No              Printer= No

GPIB Parameters:
Address= Off              Input= Ignore CR      Output= None

Printer Interface:
Parallel
```

Figure 3-103. Configuration Printout

3.4.5.13 Exiting the Configure Mode

Pressing the LEFT pushbutton (several times, if necessary) will exit the Configure mode and enter the Set mode. Turning the access keyswitch to the ENABLE position will exit the Configure mode and enter the Enable mode.

3.5 MEASUREMENT SPEED

The maximum time required for a test is dependent on the following factors: Stress voltage, Stress soak time, Check voltage, Check soak time, DUT capacitance, and actual Stress and Check Charge Rates. This section provides the necessary information to calculate the maximum test time from the values of these factors.

A Flash Test is broken down into the following sequence: Part Present test charge, Stress test charge, Stress test soak, Stress test discharge, Part Present test (and Check test) charge, Check test soak, and Check test discharge. After the test is complete, some time must be allowed for the output of results if an output interface is used. By adding up the time required for each of these steps, the total test time can be calculated. Table 3-7 provides formulas to allow the time for each step to be calculated.

Table 3-7. Formulas for Calculating Total Test Time

Part Present test charge	$C * V_{ck}/I_{ck}$
Stress test charge	$C * V_{st}/I_{st}$
Stress test soak	Set by user
Stress test discharge	Same as Stress test charge
Part Present test charge	Same as first Part Present test charge
Check test soak	Set by user
Check test discharge	Same as Part Present test charge
Result output	5 milliseconds for Handler Interface; dependent on speed of external devices for Serial or GPIB

Where:

C is the DUT capacitance

V_{ck} is the Check test voltage

V_{st} is the Stress test voltage

I_{ck} is the actual Check test Charge Rate

I_{st} is the actual Stress test Charge Rate

The calculated values for I_{ck} and I_{st} can be read in the Detail screens. These calculated values should be very close to the actual DUT current. For more information, refer to Calculated DUT Current Screens, Section 3.4.3.7.1.

The other values are set by the user in the Stress Test Conditions screen and the Check Test Conditions screen. For more information, refer to Stress Test Screen, Section 3.4.3.1, and Check Test Screen, Section 3.4.3.2.

In addition to the factors listed in Table 3-7, extra time must be added to cover the timing uncertainty and the software overhead time. The soak time specification indicates that the each actual soak time could be as much as 5 milliseconds longer than selected. This will be referred to as Timing Uncertainty. Throughout the test, time is required to set the circuits for each step in a test. This is referred to as Overhead Time. A value of 10 milliseconds should be used for Overhead Time in these calculations. Combining the formulas yields Table 3-8.

Table 3-8. Maximum Test Time Formula

Maximum test time (in seconds)=

$$C*[(3*V_{ck}/I_{ck}) + (2*V_{st}/I_{st})] + SK_{st} + SK_{ck} + TU + OT + OH$$

Where:

- C is the DUT capacitance (in farads)
- V_{ck} is the Check test voltage (in volts)
- V_{st} is the Stress test voltage (in volts)
- I_{ck} is the actual Check test Charge Rate (in amperes)
- I_{st} is the actual Stress test Charge Rate (in amperes)
- SKst is the Stress soak time (in seconds)
- SK_{ck} is the Check soak time (in seconds)
- TU is the Timing Uncertainty (0.010 seconds total)
- OT is the output time (0.005 seconds for Handler Interface)
- OH is the total Overhead Time (0.010 seconds)

Table 3-9 lists the calculated maximum test time for various combinations of DUT capacitance and Stress voltages, with output to the Handler Interface included. If soak times greater than 0 are used, they must be added to these values.

Table 3-9. Examples of Calculated Test Times

DUT Capacitance	Stress Voltage (volts)	Maximum Test Time (milliseconds)
250 picofarad	1250	25.0
1 nanofarad	1250	25.1
10 nanofarad	1250	25.5
100 nanofarad	100	25.7
	500	27.3
	1250	30.3
1 microfarad	50	30.0
	250	38.0
	500	48.0
	1250	78.0
10 microfarad	50	75.0
	250	155.0
	500	255.0
	1250	555.0

Notes:

Stress and Check Soak Times = 0
Check Test Voltage = 50 volts
Actual Charge Rates = 50 milliamperes
Times include output to Handler Interface

3.6 HANDLER INTERFACE

3.6.1 Capabilities

The 5300 communicates with a Component Handler by means of the Handler Interface. This interface provides inputs to allow the handler to gain control of the 5300 and to initiate a test. It also provides outputs to send system status and test results to the handler. The Handler Interface is installed in any of the available rear-panel Circuit Assembly Slots.

3.6.2 Pin Assignments

There is a 36-pin connector on the Handler Interface that is used to connect to the handler through the (user-supplied) Handler Interface cable assembly. Figure 3-104 provides a view of this connector. Table 3-10 provides the pin assignments for this connector. An appropriate connector to mate with the Handler Interface connector is an Amphenol part number 57-10360.

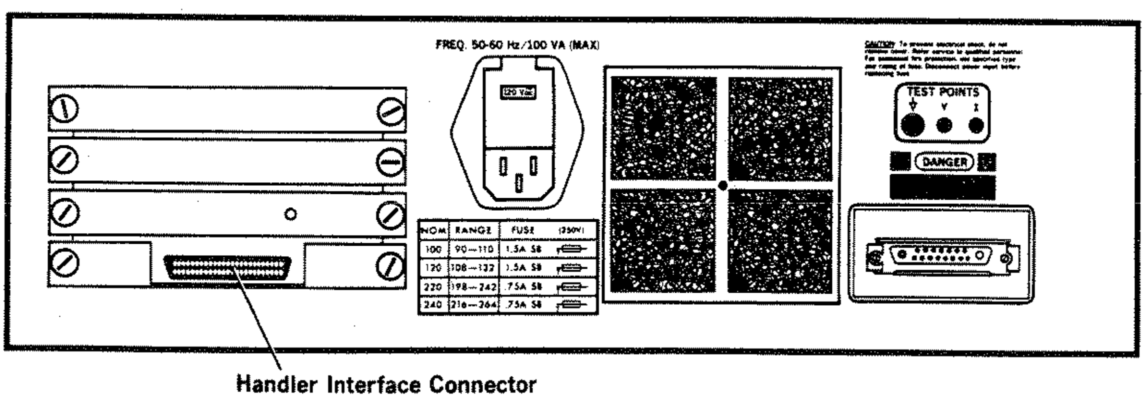


Figure 3-104. Handler Interface Connector

Table 3-10. Handler Interface Connector Pin Assignments

Cable Line Number	Connector Pin Number	Function
1	1	Shield
2	19	Output Supply (-) (External)
3	2	Input Supply (+) (External)
4	20	Output Supply (+) (External)
5	3	REQUEST Input
6	21	START Input
7	4	Not Used
8	22	Not Used
9	5	ACTIVE Output
10	23	BUSY1 Output
11	6	BUSY2 Output
12	24	One-of-Nine (MSB) Output
13	7	One-of-Nine and Binary (MSB) Output
14	25	One-of-Nine and Binary Output
15	8	One-of-Nine and Binary Output
16	26	One-of-Nine and Binary Output
17	9	One-of-Nine and Binary (LSB) Output
18	27	One-of-Nine Output
19	10	One-of-Nine (LSB) Output
20	28	Not Used
21	11	Not Used
22	29	Not Used
23	12	Not Used
24	30	Not Used
25	13	Not Used
26	31	Not Used
27	14	Not Used
28	32	Not Used
29	15	Not Used
30	33	Not Used
31	16	Not Used
32	34	Not Used
33	17	Not Used
34	35	Not Used
35	18	Not Used
36	36	ALIVE Output

3.6.2.1 Power Connections

All of the inputs and outputs in the Handler Interface are optically isolated to prevent the noise present on the input lines from being introduced into the 5300's circuitry. As indicated in the table, cable lines 2, 3, and 4 are involved with supplying power to the Handler Interface.

Lines 2 and 4 are used to supply an external source of power to the output circuitry in the Handler Interface. The positive side of a supply of 5 to 28 VDC must be connected to line 4, with its negative side connected to line 2.

Line 3 is used to supply an external source of power to the input circuitry on the Handler Interface. The positive side of a supply of 5 to 28 VDC must be connected to line 3. The negative side of this supply is used by the handler to control the inputs.

Further information about the use of these external power connections is found in the following sections.

3.6.2.2 Control Inputs

There are two inputs on the Handler Interface: REQUEST and START. Both of these inputs are powered externally, through Input Supply (+). Both inputs have similar circuitry. Figure 3-105 is an illustration of the input circuitry.

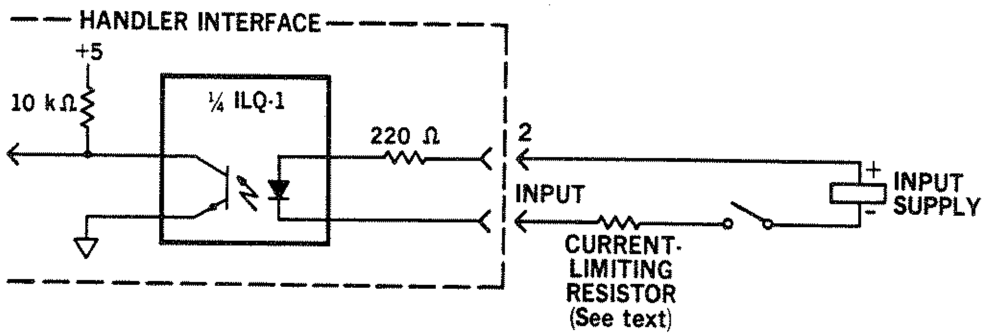


Figure 3-105. Handler Interface Input Circuit

An input is in the off state when nothing is connected to it. The input is put in the on state by connecting it to the Input Supply (-) through a current-limiting resistor. The current-limiting resistors are chosen for a current range of 5 to 20 milliamperes. Their value should be the standard (5%) value closest to that calculated from the following formula:

$$R = (V_{supply} - 5\ V)/0.015\ A$$

Where:

V_{supply} is the voltage supplied to Input Supply (+)

0.015 A is the desired current throught the LED

Table 3-11 lists the appropriate resistor value for various supply voltages.

Table 3-11. Current-Limiting Resistor Values

Input Voltage (volts)	Resistor Value (ohms)
5 or 6	None Required
10	330
12	470
15	680
24	1.2 k
28	1.5 k

The REQUEST input is used by a Smart handler to request control of the 5300. Connecting this input (through a resistor) to the Input Supply (-) signals that the handler is requesting control. If control is granted, the ACTIVE output line will become a low impedance to Output Supply (-). The handler will retain control until the REQUEST input is returned to a high impedance state. This input is not used with a Basic handler.

The START input is used by the handler to request the 5300 to begin a test. Connecting this line (through a resistor) to the Input Supply (-) signals that the handler is requesting that the 5300 begin testing. The status of the BUSY outputs (discussed in the next section) indicate when the START signal is accepted. The START signal must be returned to a high impedance state **after** the BUSY outputs indicate that it was accepted.

> **NOTE:** To help in ensuring the integrity of test results, the 5300 enters an error state when a START signal is received while a test is in progress. The test is aborted and **all** outputs (including ACTIVE, but excluding ALIVE) are set to a high impedance (0) state. The 5300 will not continue testing until 100 milliseconds have passed with no START or REQUEST signals being received.

NOTE: In normal Handler Interface operation, the handler must **sink** current **from** the Handler Interface. If a Basic handler is used, the START input is the only input required. If the Basic handler is designed to source current or to provide a positive polarity START signal, this can be accommodated by connecting the handler's START output to the Handler Interface pin 2 (normally connected to the (+) side of the Input Supply) and by grounding the START input (through the appropriate current-limiting resistor). Figure 3-106 is an example of this case. This method can **not** be used with a Smart handler.

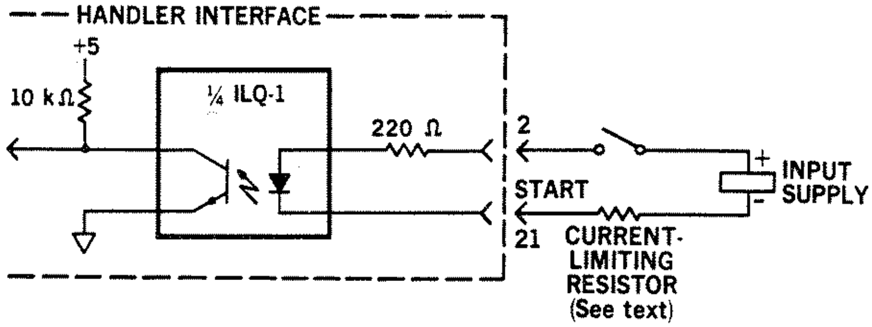


Figure 3-106. Connecting the START Input to a Basic Handler with Positive Polarity

3.6.2.3 Control Output Signals

There are two sets of outputs on the Handler Interface: Control and Binning. The Control outputs (ALIVE, ACTIVE, BUSY1, and BUSY2) indicate system status. The Binning outputs indicate test results. The Binning outputs are discussed in the following section.

All outputs (including Binning outputs) have similar circuitry. Figure 3-107 shows part of the output circuitry of the Handler Interface, indicating how optical isolation is accomplished and how the input power is used.

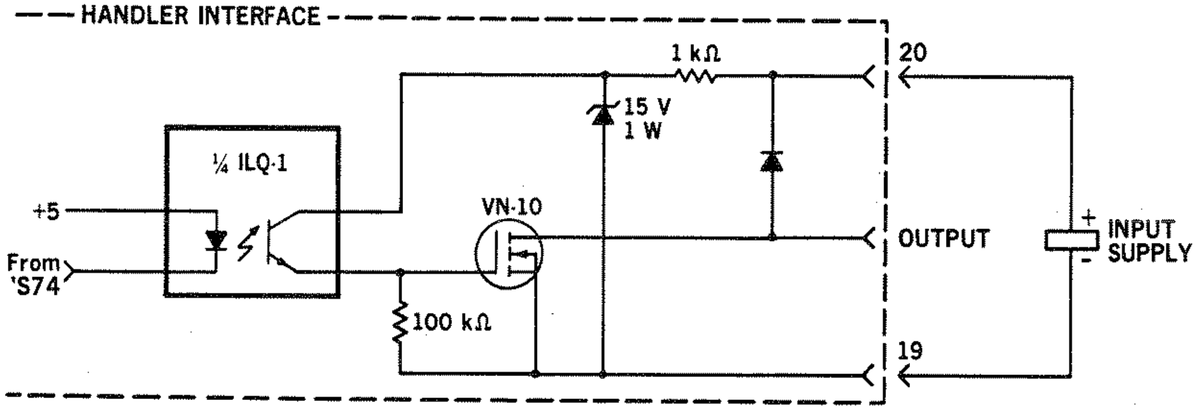


Figure 3-107. Handler Interface Output Circuit

All outputs are in a low impedance to Output Supply (-) when in the active (true) state, and high impedance when in the inactive (false) state.

The ALIVE output signals that the 5300 is powered-up and functioning. As part of the power-up process, the ALIVE output is connected with low impedance to Output Supply (-). If there is a system failure, this output will switch to a high impedance state.

The ACTIVE output is used by the 5300 to signal that the Smart handler has been granted control of the 5300. This line is connected to Output Supply (-) when active and is returned to high impedance to signal that the handler no longer has control.

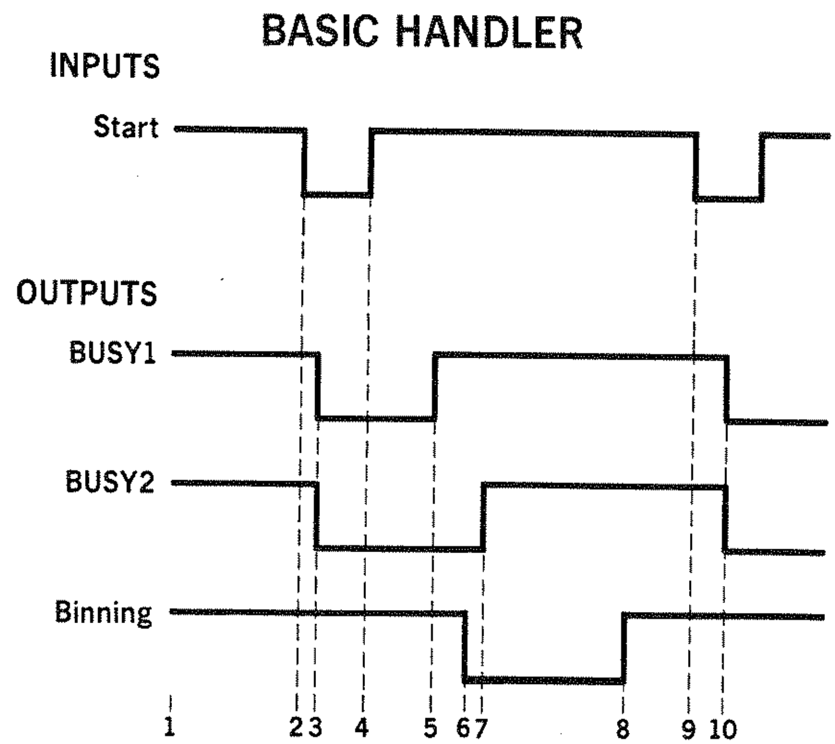
There are two BUSY outputs, BUSY1 and BUSY2, that are used by the 5300 to signal that a test is in progress. Both become low impedance to Output Supply (-) when the START signal is accepted by the 5300. This signifies that the test has begun and that an additional START will cause a Double Start error. After such an error, all binning outputs are set to high impedance (0). The 5300 must be given 100 milliseconds with no START signals for normal testing to resume.

When the test is completed **and the START input has been returned to high impedance**, BUSY1 will return to the high impedance state. This signals that the DUT can be removed from the test head and the next part can be put in place.

At the same time as the BUSY1 signal is changed to a high impedance state, the binning results are sent to the outputs. Because of minor variations in the components used on the Handler Interface, the BUSY1 and binning results may not appear on the connector at exactly the same time. For this reason, the BUSY2 signal is provided.

About 1 or 2 milliseconds after the BUSY1 and test results are sent to the Handler Interface, BUSY2 will return to the high impedance state. This delay ensures that the test results will be valid when BUSY2 is at a high impedance. The test results are held on the outputs until either the next test is completed or the Data Hold time has passed, whichever occurs first. If the Data Hold time passes before the next test is complete, the test result outputs change to a high impedance state.

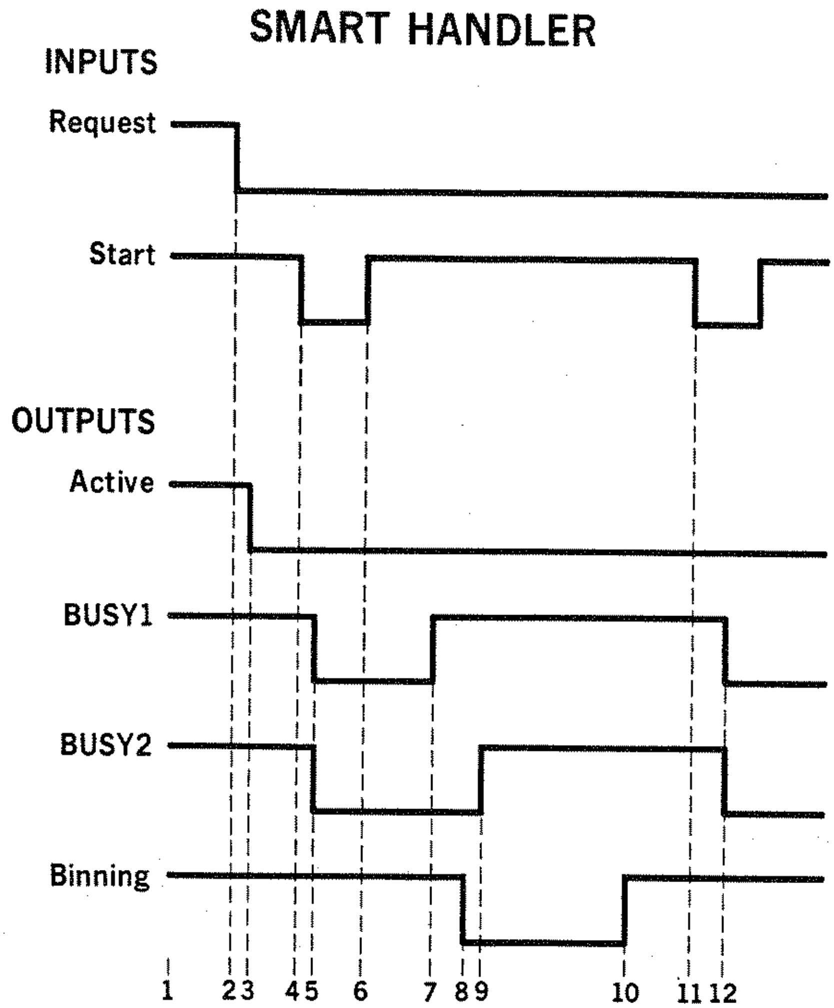
The two BUSY signals provide flexibility in interfacing the 5300 to a handler. For fastest testing, both signals should be used. When BUSY1 goes to a high impedance at the end of a test, the DUT should be moved out of the test head and the next DUT put in place. Once BUSY2 has gone to a high impedance state, the next start should be issued and the test results should be read. Figure 3-108 is a timing diagram of this application with a Basic handler. Figure 3-109 is a timing diagram of this application with a Smart handler.



1 - Instrument waiting
2 - Handler requests a test
3 - Test begins
4 - Handler releases Start request
5 - Test complete, handler can remove DUT
6 - Binning results have settled
7 - BUSY2 indicates that binning results are valid
8 - Data Hold time passes, binning results are cleared (no longer valid)
9 - Handler requests another Start
10 - Next test begins

NOTE: If 9 occurs before 8, the next test begins and binning results are cleared when the Data Hold time passes or 5 (of the new test) occurs

Figure 3-108. Basic Handler Timing For Fastest Testing

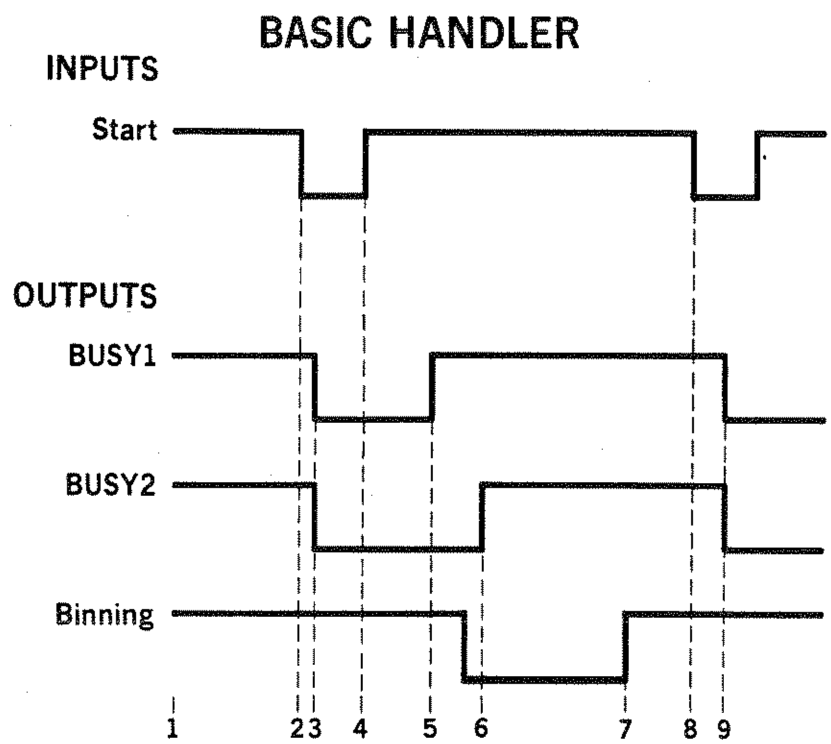


1 - Instrument waiting
2 - Smart handler requests control
3 - Handler granted control
4 - Handler requests a test
5 - Test begins
6 - Handler releases Start request
7 - Test complete, handler can remove DUT
8 - Binning results have settled
9 - BUSY2 indicates that binning results are valid
10 - Data Hold time passes, binning results are cleared (no longer valid)
11 - Handler requests another Start
12 - Next test begins

NOTE: If 11 occurs before 10, the next test begins and binning results are cleared when the Data Hold time passes or 7 (of the new test) occurs

Figure 3-109. Smart Handler Timing For Fastest Testing

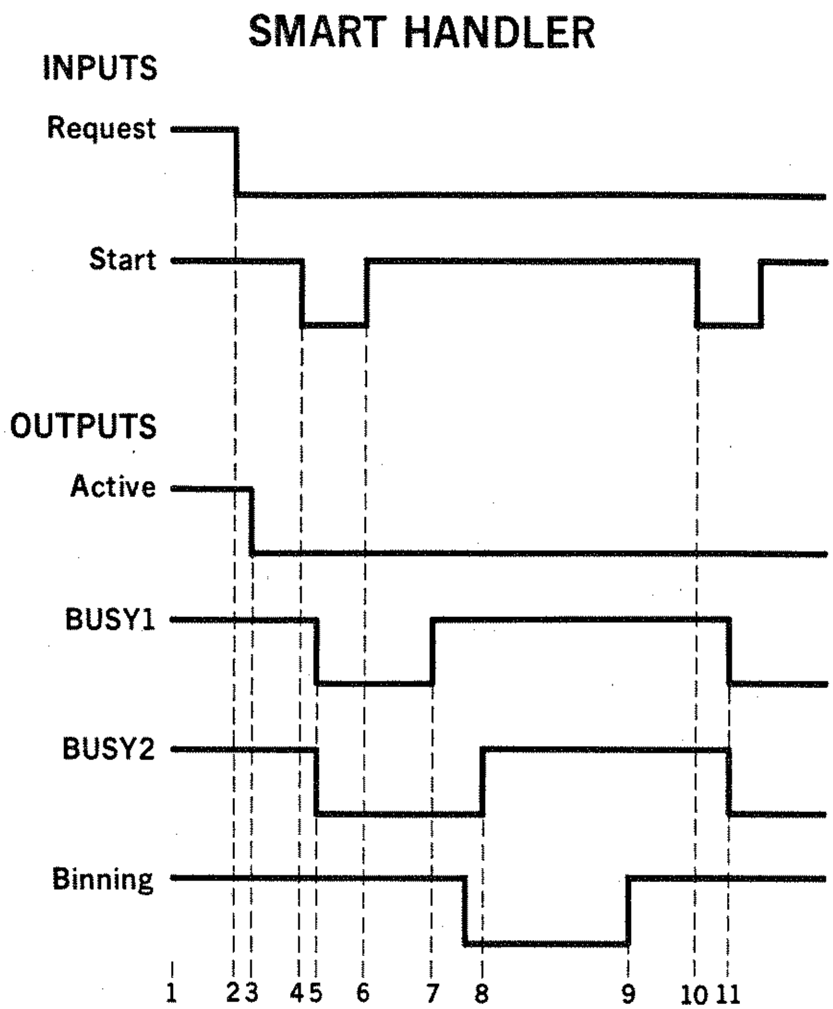
For systems that require a simpler handshaking method, the BUSY2 signal should be used alone. When BUSY2 goes to a high impedance at the end of a test, the DUT should be moved out of the test head, the next DUT should be put in place, and the test results should be read. Figure 3-110 is a timing diagram of this application with a Basic handler. Figure 3-111 is a timing diagram of this application with a Smart handler.



1 - Instrument waiting
2 - Handler requests a test
3 - Test begins
4 - Handler releases Start request
5 - See NOTE
6 - Test complete, handler reads binning results, removes DUT, and places a new DUT
7 - Data Hold time passes, binning results are cleared (no longer valid)
8 - Handler requests another Start
9 - Next test begins

NOTE: If 8 occurs before 7, the next test begins and binning results are cleared when the Data Hold time passes or 5 (of the new test) occurs

Figure 3-110. Basic Handler Timing For Simple Handshaking



1 - Instrument waiting
2 - Smart handler requests control
3 - Handler granted control
4 - Handler requests a test
5 - Test begins
6 - Handler releases Start request
7 - See NOTE
8 - Test complete, handler reads binning results, removes DUT, and places a new DUT
9 - Data Hold time passes, binning results are cleared (no longer valid)
10 - Handler requests another Start
11 - Next test begins

NOTE: If 10 occurs before 9, the next test begins and binning results are cleared when the Data Hold time passes or 7 (of the new test) occurs

Figure 3-111. Smart Handler Timing For Simple Handshaking

3.6.2.3.1 Open-Loop Handlers

The flexibility of the Handler Interface also allows it to be used with an open-loop handler. This type of handler ignores the BUSY lines and sends START signals at regular intervals. After a predetermined length of time (maximum test time), the handler assumes that the test has been completed, reads the binning result, prepares for the next test, and issues another START signal. For information on calculating the maximum test time, refer to MEASUREMENT SPEED, Section 3.5.

> **NOTE:** Although the 5300 can accommodate open-loop handlers, closed-loop systems (using the BUSY signals) are preferred as they can provide higher performance and greater data integrity.

Since the open-loop handler does not verify that the test has been completed, it may issue a START signal before a test has been completed. The binning result read by the handler would have been invalid, causing improper binning of the DUT. If the handler continues to issue START signals early, and if the instrument continues to perform tests, all DUTs could be improperly binned.

The 5300 deals with this problem by not allowing a START before a test has been completed. If such a START signal is received, the 5300 issues a Double Start error message, sets **all** outputs (except ALIVE) to high impedance (all zeroes), and terminates testing. The 5300 will not allow another test to begin until 100 milliseconds have passed without receiving another START. If the handler is issuing START signals more frequently than 100 milliseconds, the 5300 will stay in the Double Start error condition and the binning output will always be 0. If the handler is set to bin all DUTs with a test result of 0 as Retest, the parts that were not tested (because of the Double Start error) will be safely binned as Retest.

A second problem can occur with open-loop handlers when a START line failure occurs in the cable between the 5300 and the handler. In this case, the 5300 never conducts another test. If the binning result was always held until the next test, it would appear to the handler that all DUTs has the same result as the last DUT before the START line failed.

This problem is minimized with the Data Hold feature. This feature allows the length of time that the binning result is held on the binning outputs to be set by the user. After this length of time, all binning outputs go to a high impedance state (all zeroes). If the handler bins all DUTs with a test result of 0 as Retest, the parts that were not tested (because of the START line failure) will be safely binned as Retest.

For information regarding the Data Hold feature, refer to the following section.

3.6.2.4 Binning Outputs

At the completion of each test initiated through the Handler Interface, the test result is output on the Handler Interface. Each type of result (Pass, Stress Fail, Check Fail, etc.) is assigned a particular output pattern, or bin. The results can be output in either of two formats: One-of-Nine or Binary. The assignment of these bins to each type of result and the choice between One-of-Nine and Binary are made in the Handler screens in the Configure mode.

Table 3-12. Handler Interface Binning Output Pin Assignments

Cable Line Number	Connector Pin Number	Output: One-of-Nine	Output: Binary
12	24	Bit 7 (MSB)	Not Used
13	7	Bit 6	Bit 4 (MSB)
14	25	Bit 5	Bit 3
15	8	Bit 4	Bit 2
16	26	Bit 3	Bit 1
17	9	Bit 2	Bit 0 (LSB)
18	27	Bit 1	Not Used
19	10	Bit 0 (LSB)	Not Used

There are eight output lines on the Handler Interface that are used when the One-of-Nine mode has been selected. Table 3-12 indicates the pin assignments for these lines. Nine different output patterns can be used on these eight lines. Eight of these patterns consist of one output line connected to Output Supply (-) (=digital 1), while the others remain at high impedance (=digital 0). The ninth output state consists of all outputs left at high impedance. The particular output pattern used for each type of test result is selected in the Handler screens of the Configure mode.

When the Binary output mode is selected, only five of the Binning output lines are used to signal test results. When a test is completed, some combination of these lines will be connected to Output Supply (-) (= digital 1), while the others will remain at high impedance (= digital 0). The particular output pattern used for each type of test result is selected the Handler screen of the Configure mode.

For further information about the individual Handler screens, refer to Results Screen 3.6.3.4, and Binning Output Selection Screens, Section 3.6.3.5.

3.6.3 Handler Parameter Screens

Certain characteristics of the operation of the Handler Interface are selected at the front panel of the 5300. The set of screens that allow these selections are called the Handler Parameter screens. Access to these screens is obtained when in the Configure mode by pressing the DOWN pushbutton until the Handler Entry screen is displayed. Figure 3-112 is an illustration of this screen.

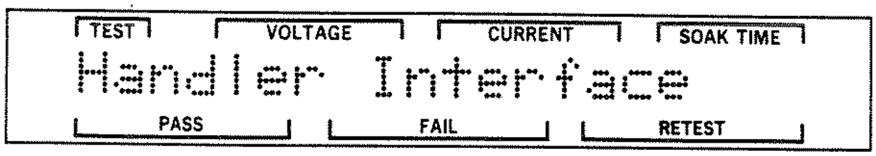


Figure 3-112. Handler Entry Screen

Pressing the RIGHT pushbutton when the Handler Entry screen is displayed will display one of the individual Handler screens. Pressing the UP or DOWN pushbutton repeatedly will scroll through all of the Handler screens. Pressing the LEFT pushbutton will return to the Handler Entry screen. Table 3-13 is a list of these screens and the choices available for each. The choices are changed by pressing the INC or DEC pushbutton (when the Bin Count totals are all 0). The following sections describe each of these screens.

Table 3-13. Handler Screens

Screen	Choices
Type	Smart, Basic
Probe Fail #	Never, 2 through 99
Data Hold	10 milliseconds to 9.9 seconds, Indefinite
Results	Binary, One-of-Nine
Pass	Output Code
St Leakage	Output Code
Ck Leakage	Output Code
Arc	Output Code
Short	Output Code
NPP	Output Code
Interlock	Output Code
Analog Error	Output Code

3.6.3.1 Type Screen

The Type screen has two choices: Smart and Basic. Figure 3-113 is an example of the Type screen.

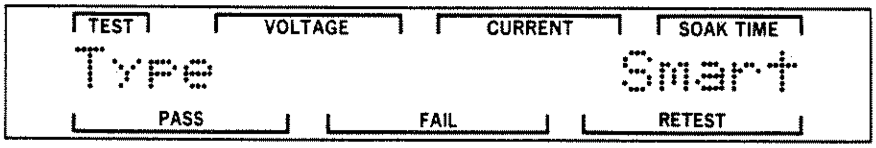


Figure 3-113. Handler Type Screen

This selection determines what is required of the handler before it can initiate a test. A Smart handler must first gain control of the system before it can start a test. A Smart handler requests control by placing a REQUEST signal on the Handler Interface connector. The 5300 signals that control has been granted by returning an ACTIVE signal. While the Smart handler has control, no device may change test parameters, nor may any other device initiate a test. While the Smart handler has control, it may initiate a test by sending a START signal to the Handler Interface.

If Basic is selected, the handler is not allowed to gain control of the system. A test is requested by sending a START signal to the Handler Interface. If no remote device has control (or if the controlling device has permitted the handler to initiate a test), the test will begin.

For more information regarding the Handler Interface input and output signals, refer to the preceding sections.

3.6.3.2 Probe Fail # Screen

The Probe Fail # screen has choices from 2 to 99 plus Never. Figure 3-114 is an example of this screen.

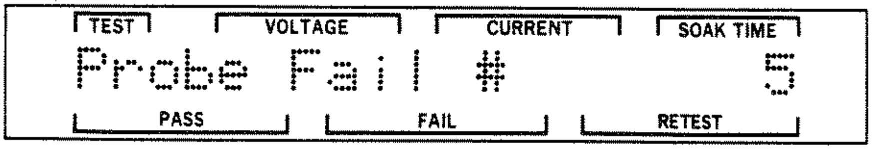


Figure 3-114. Probe Fail # Screen

If a test head probe has failed, it may make poor contact with the DUT. This poor contact will cause the DUT to fail the Part Present test. This would cause all parts to be binned as NPP (No Part Present) whenever a probe fails.

After a specified number of Part Present failures the 5300 will assume that there is a failed probe and will display a [*** Probe Fail ***] error message. This number is selected as the Probe Fail #.

For example, if the Probe Fail # is set to 5 and a series of five DUTs fail their Part Present tests, the 5300 will display the error message indicating that there is a probe failure.

If Never is selected for Probe Fail #, the 5300 will continue testing, regardless of the number of Part Present test failures.

> **NOTE:** The 5300 makes probe failure decisions only for tests initiated by a Basic handler.

3.6.3.3 Data Hold Screen

The Data Hold screen has choices from 10 milliseconds to 9.9 seconds and Intefinite. Figure 3-115 is an example of this screen.

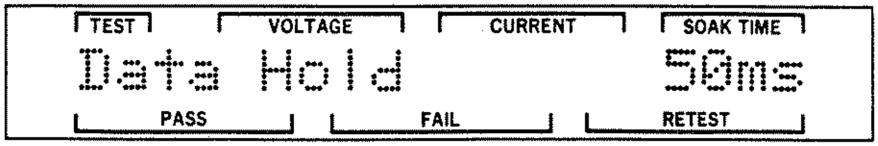


Figure 3-115. Data Hold Screen

After a test is completed, the 5300 sends the results to the Handler Interface. The results are held there until either of the following occurs: the Data Hold time passes or the next test is completed (as indicated by BUSY1 returning to a high state). Setting Data Hold to a short length of time (about one test cycle length) provides some data integrity when used with open-loop handlers (that ignore the BUSY1 and BUSY2 signals). For more information about the use of the 5300 with such handlers, refer to Open-Loop Handlers, Section 3.6.2.3.1.

When the 5300 is used with a closed-loop handler, Data Hold should be set to its maximum time or Indefinite.

3.6.3.4 Results Screen

The Results screen has two choices: Binary and One-of-Nine. Figure 3-116 is an example of this screen.

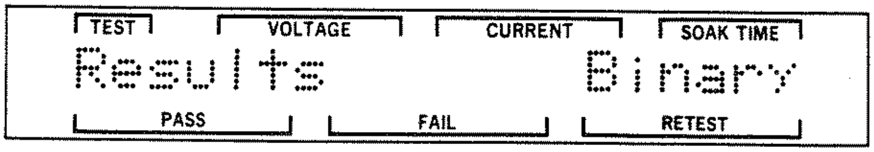


Figure 3-116. Results Screen

The Results screen selects the format in which the binning result will be output on the Handler Interface. In the Binary mode, five output lines are used. Other handler screens allow a five-bit binary number to be selected for each output condition. This output format may be preferred when a computer will be reading the binning result and controlling the binning hardware.

In the One-of-Nine mode, eight output lines are used. Other handler screens allow one particular output line (or none) to be selected for each output condition. The eight output lines allow eight different output states, each consisting of one output with low impedance to Output Supply (-) (=digital 1) and the other outputs at high impedance (=digital 0). The ninth output state consists of all outputs at high impedance. This output format provides easy decoding of the results. For example, solenoids that perform the binning functions could be driven directly.

3.6.3.5 Binning Output Selection Screens

The remaining Handler screens allow selection of the binning output codes for each type of test result. This allows the Binning outputs to be configured in a manner that is most convenient for the handler.

There are two output codes for each binning result. One is in the Binary format, the other is in the One-of-Nine format. The selection at the Results screen determines which format will be used and which format will be displayed at each Binning Output Selection screen. The binning output selections for the format not displayed are still held in the 5300's memory. Changing the selection at the Results screen will allow them to be displayed.

When in the Binary format, each Binning Output Selection screen will display a five-digit binary number (each digit is either 0 or 1) next to the result. Pressing the INC or DEC pushbutton will increase or decrease the value of the binary number. The binary number represents the state of the Binning outputs when that particular test result has occurred. A 0 indicates that the output will be at high impedance; a 1 indicates that the output will be at low impedance to Output Supply (-). For example, refer to Figure 3-117 as a possible Binning Output Selection screen.

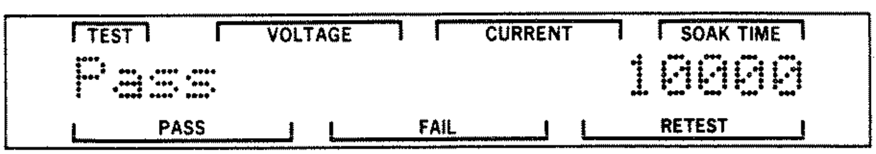


Figure 3-117. Binning Output Selection Screen

In this example, the output for parts that pass is shown. The number shown consists of five digits, indicating that Binary is the selection at the Results screen. The digits of the number (10000) indicate that if a DUT passes a test, the Binning outputs will be set with one output (cable line 13) at low impedance and the other outputs (cable lines 14 through 17) at high impedance.

The following is an example of changing the code used to indicate a Pass.

> **NOTE:** Before attempting to change the information shown in a handler screen, the Bin Count totals must be set to 0. For more information on setting these totals to 0, refer to Resetting the Bin Count Totals, Section 3.4.4.3.

STEP 1. With the instrument in the Configure mode, press the UP or DOWN pushbutton until the Handler Entry screen is displayed, as shown in Figure 3-118. For information on entering the Configure mode, refer to Entering the Configure Mode, Section 3.4.5.1.

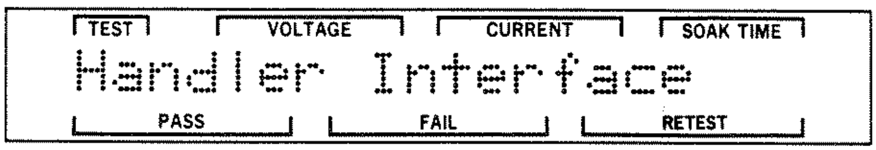


Figure 3-118. Handler Entry Screen

STEP 2. Press the RIGHT pushbutton to display a Handler screen. Press the UP or DOWN pushbutton until the St Fail screen is displayed. Figure 3-119 is an example of this screen.

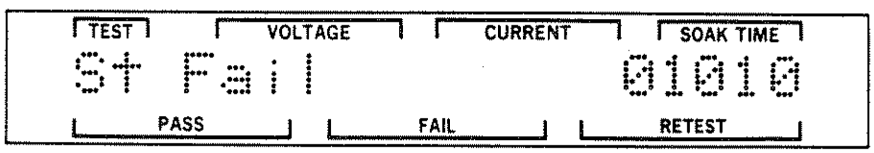


Figure 3-119. St Fail Screen

STEP 3. Press the INC or DEC pushbutton. Notice that the number at the right of the display changes with each press. Continue to press the pushbuttons until the desired number is displayed.

STEP 4. Return to the Handler Entry screen by pressing the LEFT pushbutton.

Each Binning Output Selection corresponds to one or more Detailed Bins. Table 3-14 lists all of the Binning Output Selection screens and the Detailed Bins they include. For example, an Arc output is used for parts that are included in Arc Presence, Arc Stress Up, Arc Stress Down, Arc Check Up, Arc Check Soak, and Arc Check Down. For more information on the Detailed Bins, refer to Print Detailed Bin Count Totals Screen, Section 3.4.3.5.3.

NOTE: The Error output (shown in the following Table) does not have a screen, nor is it programmable; it will always have an output code of 0 (all outputs high impedance).

Table 3-14. Binning Output Selections

Selection	Detailed Bins Included
Pass	Pass
Stress Fail	Stress Leakage, Stress Ramp
Check Fail	Check Leakage, Check Ramp
Arc	Arc Presence, Arc Stress Up, Arc Stress Soak, Arc Stress Down, Arc Check Up, Arc Check Soak, and Arc Check Down
Short	Short
NPP	Stress Open, Check Open
Interlock	Cancel Interlock, Refuse Interlock
Analog Error	Cancel Zero Volts, Cancel ESD, Refuse Zero Volts, Refuse HV Clamp, Refuse High Temp, Refuse ESD
Error (See NOTE)	Cancel Abort, Instrument Failure

3.6.3.5.1 Suggestions for Selecting Output Codes

The 5300 allows complete control of the output codes used for test results. This section is intended to provide suggestions to assist in selecting the appropriate codes for an application.

The different outputs can be grouped into the following four logical groups: Pass (Pass), Fail (Stress Fail, Check Fail, Arc, Short), Retest (NPP), and Error (Interlock, Analog Error, Error). Typically, the Passing parts will be binned as Good, the Failed parts will be binned as Bad, and the Retest and Error parts will be binned as Retest. To simplify the binning process, it may be useful to select the output codes such that these groups are readily apparent.

When the Data Hold time has passed after the end of a test, all Handler Interface outputs become 0s (high impedance). It is recommended that this code be reserved for parts that will be retested.

3.6.3.5.1.1 One-of-Nine Binning Format

The One-of-Nine binning format (selected at the Results screen) allows a different output line to be used for each test result. This format would typically be used when the outputs are driving the binning equipment directly. For example, solenoids could be driven from the outputs, with no extra circuitry (other than the power supply) required.

If the One-of-Nine output is selected, a simple approach would involve selecting 00000000 for the Retest and Error codes, 01000000 for the Fail codes, and 10000000 for the Pass code. This would require only two binning wires, the two most significant bits. Table 3-15 suggests the assignment of these codes for this simple arrangement and a more detailed reporting.

Table 3-15. Suggested One-of-Nine Codes

Result Condition	Result Type	Simple Code	Detailed Code
Pass	Pass	10000000	10000000
St Fail	Fail	01000000	01000000
Ck Fail	Fail	01000000	01000000
Arc	Fail	01000000	01000000
Short	Fail	01000000	01000000
NPP	Retest	00000000	00100000
Interlock	External Error	00000000	00010000
Analog Error	Internal Error	00000000	00001000

Using the detailed codes of Table 3-15, the upper 5 lines are required for binning. The eighth bit set indicates that the part passed, the seventh bit set indicates that the part failed, the sixth bit set indicates that either the part was open or there was a probing problem, the fifth bit set indicates that there was an internal error in the 5300, and the fourth bit set indicates that there was an error outside of the 5300. For simpler binning, the eighth and seventh lines could be used for Pass and Fail, with Retest binning used when these two lines are 0s.

3.6.3.5.1.2 Binary Binning Format

The Binary binning format (selected at the Results screen) allows multiple output lines to be used to signal each result. Using this format can compress the output data on fewer lines. This format would typically be used when the results will be read by a computer that will control the binning equipment.

When Binary output is selected, the upper two bits can be used to indicate Pass/Fail/Retest status. The highest bit can be 1 for Pass, 0 for Fail and Retest (and all Errors). The second highest bit separates Fail (1) from Retest and all Errors (0). In cases where an NPP or Error occurred, the third highest bit separates External (and NPP) Errors (1) from Internal Errors (0). The lowest two bits identify the particular type of Fail or Error. This can be accomplished using the settings of Table 3-16.

Table 3-16. Suggested Binary Codes

Result Condition	Result Type	Code
Pass	Pass	10000
St Fail	Fail	01001
Ck Fail	Fail	01010
Arc	Fail	01100
Short	Fail	01101
NPP	Retest	00110
Interlock	External Error	00101
Analog Error	Internal Error	00011

The selections of Table 3-16 allow the upper two bits to determine the Pass/Fail/Retest binning status of the part, while the lower bits allow the exact test result to be read.

3.7 COMMUNICATION INTERFACES

There are two communication interfaces available for the 5300: GPIB and RS-232C. The following sections describe the characteristics of each interface. Refer to PROGRAMMING, Section 3.8, for information about the commands that are common to both interfaces.

3.7.1 GPIB (General Purpose Interface Bus)

The GPIB interface follows the IEEE Standard 488-1978 for Programmable Instrumentation. This section provides a general description of the GPIB bus signal lines and provides information on the selection screens used to select GPIB message terminators and the 5300 device address. For detailed information regarding other GPIB requirments refer to the ANSI/IEEE Standard 488-1978 titled, "IEEE Standard Digital Interface for Programmable Instrumentation."

3.7.1.1 GPIB General Description

The 5300 GPIB interface is designed to communicate through a parallel port, as defined by the IEEE-488 Interface Specification. This allows the exchange of commands and responses between the controlling device and the 5300. When installed in the 5300, the IEEE-488 Interface allows a remote device (typically a computer) to have complete control of the 5300. The computer can set the test conditions, initiate tests, and request and receive test results. For infromation on the commands used to control the 5300, refer to PROGRAMMING, Section 3.8.

The GPIB interface communicates through a set of 16 signal lines that can be separated functionally into three dedicated groups:

An eight-bit bidirectional data bus
Three data transfer (handshake) lines -- DAV, NRFD, and NDAC
Five general management lines -- ATN, EOI, IFC, REN, and SRQ

Information is transferred along the bus in bit-parallel, byte-serial fashion by an asychronous handshake. Data transfer (handshake) signals (DAV, NRFD, and NDAC) regulate the transfer of each byte of data between devices. The five general management lines perform such tasks as designate device function, initialize the bus devices, signal interrupts, identify end of data string, and enable or disable remote only operation of devices.

Devices connected to the bus are classified by the functions they perform. A device can provide many functions defined by a function code. The three basic functions of a device are defined as a talker, a listener, a controller, or it can alternate between any two or three functions. A talker transmits data; there can be only one talker at a time to avoid confusion in message and data transfer. A listener can only receive data; there can be more than one listener at a time. A controller designates which devices are to talk or listen and exercises other bus management functions; there can be only one controller at a time. Most devices today are designated as slaves rather than by talkers and listeners. Slave devices usually have the capability to do talk and listen.

The 5300 is only capable of being a basic talker or a basic listener (Slave). The way the controller designates what function each slave performs is by addressing the slave and issuing an interface message. Interface messages are covered in the IEEE Standard 488-1978 specifications. The 5300's address is programmed through the address select screen. The address can be set from Ø to 30.

3.7.1.2 Signal Lines

The 16 lines of the GPIB are subdivided by function into three separate buses: an eight-line data bus, a three-line transfer (handshake) bus, and a five-line management bus (see Figure 3-120).

The data bus (signal lines DIO 1 through DIO 8) conveys data or device-dependent messages. DIO 1 represents the least significant bit in the transmitted byte; DIO 8 represents the most significant bit. One eight-bit word can be transmitted bi-directionally in byte-serial, bit-parallel fashion. The data lines are considered active when their signal level is LOW.

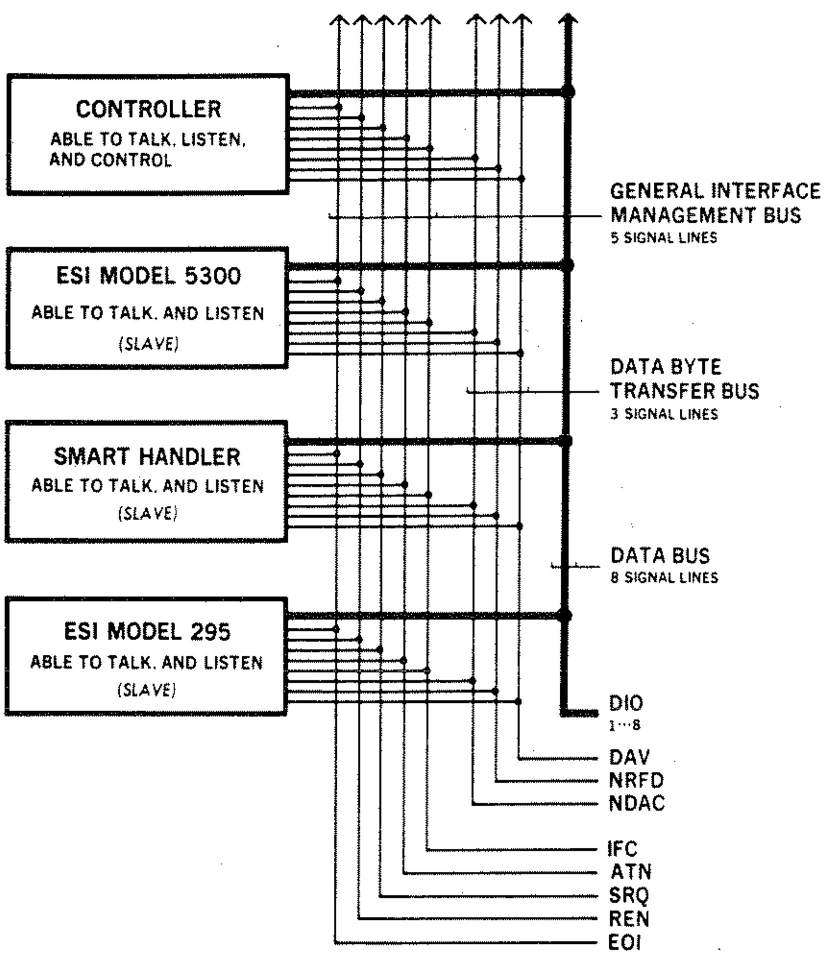


Figure 3-120. GPIB Signal Lines and Device Functions

The transfer bus performs a three-wire handshake process that is executed between the talker and all designated listeners each time a byte is transferred over the data bus. Figure 3-121 illustrates a typical handshake sequence. This handshake process assures that new data is not placed on the data bus faster than the slowest listener can receive it. The three handshake functions are:

NRFD (Not Ready For Data) -- This signal line is LOW until all addressed listeners are ready to receive the next data byte. When all addressed listeners are ready, they release the NRFD line, the NRFD signal goes HIGH, allowing the talker to place the next byte on the data line.

DAV (Data Valid) -- The DAV signal line is set LOW by the talker a short time after placing a valid byte on the data lines. This signal tells each listener to capture the byte presently on the data lines. DAV can not be set LOW until the NRFD signal goes HIGH.

NDAC (Not Data Accepted) -- The NDAC signal line is set LOW by each addressed listener until they all have captured the byte currently on the data lines. When all listeners have captured the data byte, the NDAC signal goes HIGH. With the NDAC signal HIGH, the talker is able to remove the byte from the data lines, and at that point set the DAV line HIGH until the handshake cycle is repeated.

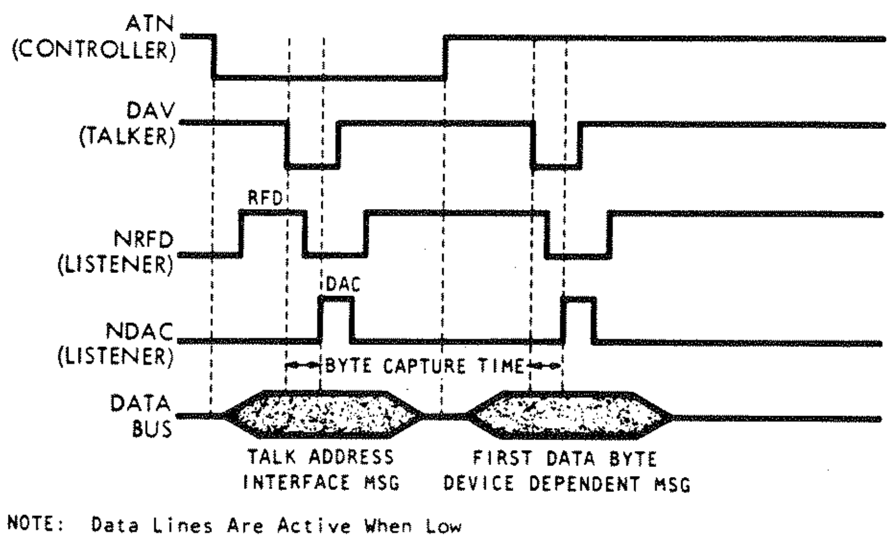


Figure 3-121. A Typical Handshake Cycle

The group of signal lines used to control the orderly flow of information across the GPIB is called the management bus. These signal lines perform such tasks as designate device functions, initialize the bus devices, signal interrupts, identify end of data string, and enable or disable remote only operation of devices. The five management bus signals are:

ATN (Attention) and **EOI** (End Identify) or -- Commands associated with these lines specify how the next data transfer on the bus is to be interpreted. See Table 3-17.

Table 3-17. ATN and EOI Definition

ATN	EOI	DATA LINE DEFINITION
0	0	Allows exchange of device-dependant messages from active talker or controller to active listener.
0	1	Active controller can send interface messages (universal commands, addressed commands, etc.). The codes corresponding to these messages are defined in Appendix E of the IEEE-488 standard.
1	0	Indicates the next eight bits are the last bits of a message.
1	1	Initiates parallel poll. This function is disabled in the 5300 upon initialization.

IFC (Interface Clear) -- This signal is set LOW by the system controller to initialize the interface functions of all devices connected to the data bus, i.e., set them to an inactive state, then return control to the system controller. If the 5300 is in the middle of a data transfer, it will clear the bus and then clear the buffered portions of the message.

SRQ (Service Request) -- This signal line is set LOW by a device connected to the data bus to request service from the system controller. The controller conducts a poll to determine which device activated the interrupt. The controller can take the appropriate action by branching to an interrupt service routine.

REN (Remote Enable) -- This signal line is set LOW by the system controller to place the 5300 in the GPIB mode. On the 5300 there is one section of the software dedicated to the GPIB. (This section acts as per the RL2 function [Remote/Local], immediately entering remote mode when asked.)

3.7.1.3 GPIB Interface Function Codes

The interface function codes are part of the IEEE Standard 488-1978. These codes define an instrument's ability to support various interface functions. There are 12 interface functions (some with as many as 28 subsets identified by a numeric value after the code) supported by, and included in, the interface standard. Table 3-17 identifies the functions supported by the 5300 by listing the 12 function codes and 5300 capabilities defined by the subset number.

Table 3-18. Model 5300 Interface Function Codes and Capabilities

CODE	INTERFACE FUNCTION
SH1	Source Handshake capability
AH1	Acceptor Handshake capability
T6	Basic Talker, serial poll, unaddressed as Listener when it receives MTA (My Talk Address)
TE0	No Extended Talk capability
L4	Basic Listener, unaddressed as talker when it receives MLA (My Listen Address)
LE0	No Extended Talk capability
SR1	Service Request capability - 5300 capable of requesting service from controller by setting SRQ.
RL2	Remote/Local capability
PP1	Parallel Poll capability - Disabled in 5300 on initialization. Status bit 7 has been set for a parallel poll service routine.
DC1	Device Clear capability - Clears data lines, parser, and insures the 5300 is ready to accept an input message.
DT1	Device Trigger capability - 5300 can have its operation started by another device or Group Execute Trigger command (same as T Trigger command). See Section 3.8.3.
C0	No Controller capability

3.7.1.4 Serial Poll Status Byte

During Service Request, when a serial poll routine is initiated, the 5300 will return a status byte indicating its current status and gives an indication if it asserted the SRQ line. There are four bits defined in the status byte returned from a GPIB serial poll. See Table 3-18.

Table 3-19. Serial Poll Status Byte Definition

MSB (left) to LSB (right):

8	7	6	5	4	3	2	1
M	I	x	O	Q	x	x	x

M - When true (1) 5300 is in Remote Mode and GPIB has control (Master 1).
I - When true (1) 5300 asserted SRQ line
O - When true (1) Parser finished, output (reply) ready
Q - When True (1) Data logging queue has at least N test results (N is set by Buffer parameter see Section 3.8.6)
x - Not defined, set low

When M, O, or Q switch from false to true, I is set and a service request is issued (SRQ). The exception occurs when the 5300 is allowed to switch to GPIB control (Master 1) when 5300 is IDLE. This situation only occurs when the 5300 is in Enable Mode and is at IDLE state when GPIB requests control (Master 1).

When M, O, and Q are all false, I is forced false.

3.7.1.5 GPIB Message Terminators

The 5300 accepts many combinations of input and output terminators using the ASCII characters CR, LF, and the EOI bus management line to indicate the end of a data I/O message. Seven different input terminators are accepted by the 5300. These combinations are listed in Table 3-19. The different combinations are accepted by selecting either the CR or Ignore CR parameter from the GPIB Input Terminator screens (see Section 3.7.2.3). The ASCII character LF (line feed) is always accepted as an input terminator.

Table 3-20. GPIB Input Terminator Combinations and Parameter Setting

TERMINATOR COMBINATION	INPUT PARAMETER TERMINATOR SELECTION
EOI	Ignore CR or CR
EOI on CR	Ignore CR or CR
EOI on LF	Ignore CR or CR
LF	Ignore CR or CR
CR	CR
CR + LF	Ignore CR
CR + EOI on LF	Ignore CR

Four different output terminator combinations can be selected from the GPIB Output Terminator screens (Refer to Section 3.7.2.3). See Table 3-20 for the different combinations.

Table 3-21. GPIB Output Terminator Combinations and Parameter Setting

TERMINATOR COMBINATION	OUTPUT PARAMETER TERMINATOR SELECTION
EOI	None
LF + EOI	LF Only
CR + EOI	CR Only
CR + LF + EOI	CR + LF

3.7.1.6 <u>GPIB Parameter Screens</u>

Configuration of the GPIB communication interface is done through the GPIB Parameter screens. These screens are accessible in the Configure mode. The following sections describe how these screens are accessed and changed.

3.7.2.6.1 Accessing the GPIB Parameter Screens

The individual GPIB Parameter screens are accessed by pressing the RIGHT pushbutton when the GPIB Interface Entry screen is displayed, a GPIB interface is installed, and the interface is inactive. The GPIB interface is considered inactive when the REN line is high. The right pushbutton LED will not be on if the conditions aren't correct.

The GPIB Interface Entry screen is displayed in the Configure mode. Figure 3-122 is an illustration of this screen. Refer to Configure Mode, Section 3.4.5 for more information about displaying this screen.

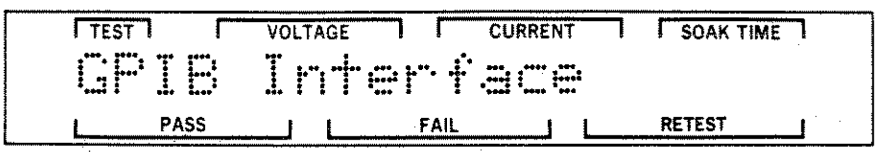


Figure 3-122. GPIB Interface Entry Screen

3.7.2.6.2 Address Select Screen

The Address Select screen is displayed by pressing the RIGHT push-button when the GPIB Interface Entry screen is displayed. If the GPIB Parameter screens were previously displayed, the UP or DOWN pushbutton may have to be pressed several times to locate the display. Figure 3-123 is an example of this screen.

> NOTE: The GPIB Printer function is not currently supported. It may be supported in a future version of software. Selecting this function may or may not operate a GPIB printer.

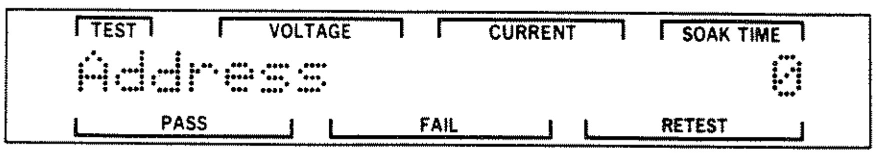


Figure 3-123. Address Select Screen

The 5300's device address can be set from 0 to 30 or the GPIB function can be switched OFF. These selections are made by pressing the INC or DEC pushbutton.

The selection Printer will allow the GPIB interface to be configured as a talk only printer interface. If Printer is selected, remember to also select the GPIB parameter in the Printer select screens.

3.7.2.6.3 Input Terminator Screen

The Input Terminator screen is displayed by pressing the DOWN pushbutton when the Address Select screen is displayed. Figure 3-124 is an example of this screen.

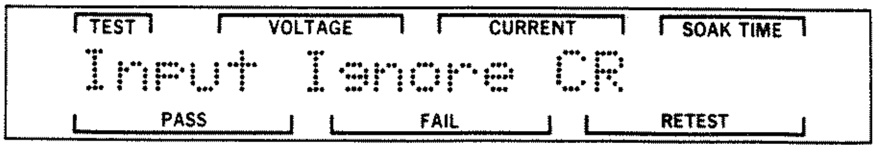


Figure 3-124. Input Terminator Screen

The 5300 will ignore or recognize a carrage return (ASCII character CR) as the end of an interface message. Use the selections to accommodate your controller's communication protocol. See Section 3.7.1.5. The selection of the desired format is made by pressing the INC or DEC pushbutton.

3.7.2.4 <u>Output Terminator Screen</u>

The Ouput Terminator screen is displayed by pressing the DOWN pushbutton when the Input Select screen is displayed. Figure 3-125 is an example of this screen.

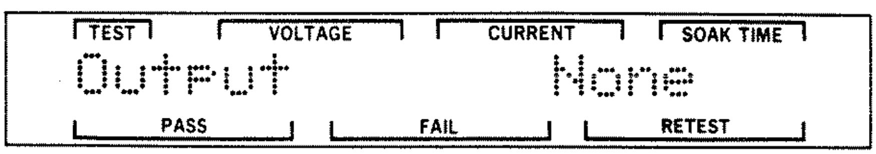


Figure 3-125. Output Terminator Screen

The 5300 will output one of four different combinations of ASCII characters to identify a message termination. You can select LF Only, NONE (uses EOI as a message terminator), CR + LF, or CR Only. See Section 3.7.1.5. Use the selections to accommodate your controller's communication protocol. The selection of the desired format is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.1.7 Pin Assignments

The 5300 GPIB Interface uses a female, 24-contact trapizoidal, D-shell connector. See Figure 3-126 for contact assignments.

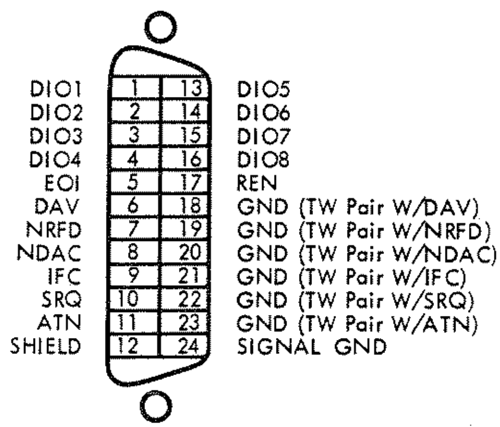


Figure 3-126. GPIB Bus Connector Contact Assignments

3.7.2 RS-232C

This section provides a general description of the RS-232C interface signal lines and provides information on the Serial Parameter screens (baud rate, data format, and line terminators).

When installed in the 5300, this interface allows a remote device (typically a computer) to have complete control of the 5300. The computer can set the test conditions, initiate tests, and request and receive the test results. For information on the commands used to control the 5300, refer to PROGRAMMING, Section 3.8.

3.7.2.2 RS-232C General Description

The RS-232C Interface conforms to the EIA RS-232C-C specifications for asychronous communications on one channel (A). The SQ, DRS, RI,secondary, and clocks are **not** supported. The interface is configured as a DTE device. Both hardware and software handshaking is supported. Refer to Section 3.7.2.4 for information on connector pin assignments.

To support hardware handshaking, the RTR line of the 5300 must connect to the CTS line of the controller. Similarly, the RTR of the controller must connect to the CTS line of the 5300. The controller must have the appropriate software to support the use of the RTR line.

> **NOTE:** Use of the RTR line is **not** part of the RS-232C standard, but it is a common extension. Some systems use the DTR (Data Terminal Ready) output to signal the input buffer status. For such systems, DTR on the controller should be connected to CTS on the 5300.

When the input queue of the 5300 is almost full, the 5300 switches off the RTR (Ready To Receive) line. This line connects to the CTS (Clear To Send) line on the controller. When the controller sees the CTS line is off, it suspends transmission. Once the 5300 has processed a significant number of characters from its input queue, it switches the RTR on and transmission continues.

If hardware handshaking is not supported or is not desired, software handshaking should be used. This is enabled by selecting Yes at the XON/XOFF screen.

When software handshaking is enabled and the input queue is almost full, the 5300 will send an XOFF character (ASCII decimal value 17) to signal the buffer condition. Upon receiving this character, the controller suspends transmission. Once the 5300 has processed a significant number of characters from its input queue, it sends an XON character (ASCII decimal value 19). The controller resumes transmission once this character is received.

> **NOTE:** The 5300 queue can support about 20 characters of overrun. Any more than 20 will result in a queue overrun error message.

3.7.2.2.1 Serial Message Terminator

The serial input must be terminated by at least one carriage return, line feed, vertical tab, or form feed. More than one are acceptable, any extra are ignored. The serial output terminator from the 5300 is selectable (See Section 3.7.2.3.6). It can be set for carriage return only, line feed only, or carriage return and line feed.

3.7.2.3 Serial Parameter Screens

Configuring of the serial communication interfaces is done through the Serial Parameter screens. These screens are accessible in the Configure mode. The following sections describe how these screens are accessed and changed.

3.7.2.3.1 Accessing the Serial Parameter Screens

The individual Serial Parameter screens are accessed by pressing the RIGHT pushbutton when the Serial Interface Entry screen is displayed, a serial interface is installed, and the interface is inactive. The RS-232C interface is considered inactive when DSR is off.

The Serial Interface Entry screen is displayed in the Configure mode. Refer to Configure Mode, Section 3.4.5 for more information about displaying this screen. Figure 3-127 is an illustration of this screen.

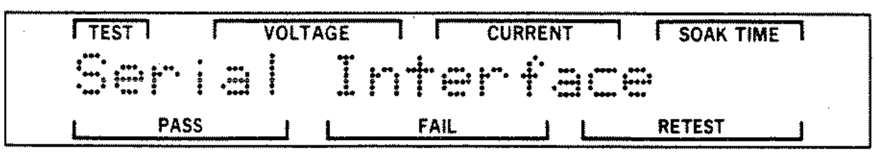


Figure 3-127. Serial Interface Entry Screen

3.7.2.3.2 Baud Rate Screen

The Baud Rate screen is displayed by pressing the RIGHT pushbutton when the Serial Interface Entry screen is displayed. If the Serial Parameter screens have previously displayed, the UP or DOWN pushbutton may have to be pressed several times to locate this screen. Figure 3-128 is an example of this screen.

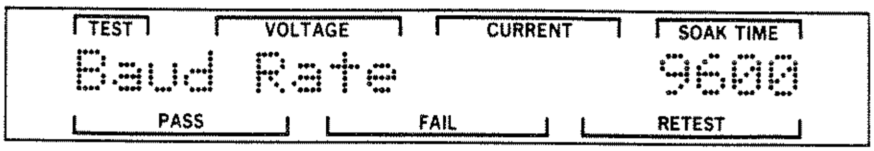


Figure 3-128. Baud Rate Screen

The 5300 can communicate at baud rates from 300 to 19,200. The same rate is used for both transmitting and receiving. The selection of the desired baud rate is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.2.3.3 Character Size Screen

The Character Size screen is displayed by pressing the DOWN pushbutton when the Baud Rate screen is displayed. Figure 3-129 is an example of this screen.

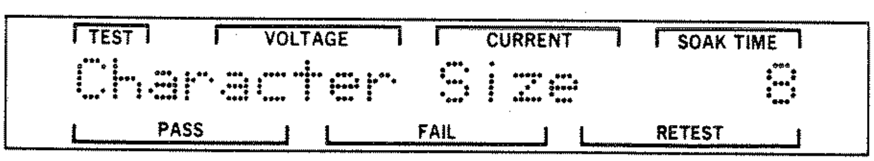


Figure 3-129. Character Size Screen

The 5300 can communicate using a 7- or 8-bit format. The selection of the desired format is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.2.3.4 Parity Screen

The Parity screen is displayed by pressing the DOWN pushbutton when the Character Size screen is displayed. Figure 3-130 is an example of this screen.

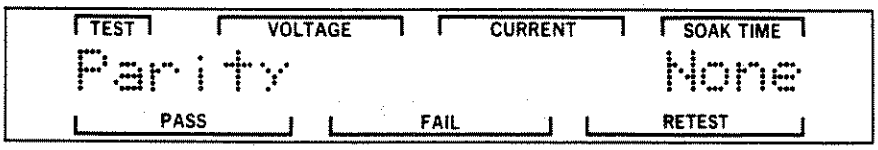


Figure 3-130. Parity Screen

The 5300 can communicate using None, Even, or Odd parity. The selection of the desired parity is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.2.3.5 Stop Bits Screen

The Stop Bits screen is displayed by pressing the DOWN pushbutton when the Parity screen is displayed. Figure 3-131 is an example of this screen.

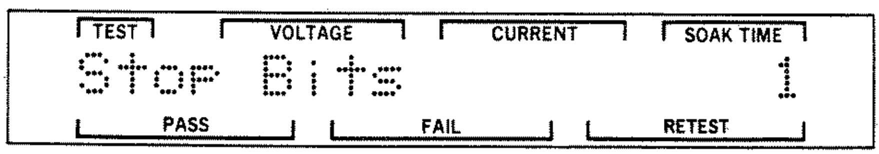


Figure 3-131. Stop Bits Screen

The 5300 can communicate using 1 or 2 stop bits. The selection of the desired number of stop bits is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.2.3.6 Output Screen

The Output screen is displayed by pressing the DOWN pushbutton when the Stop Bits screen is displayed. Figure 3-132 is an example of this screen.

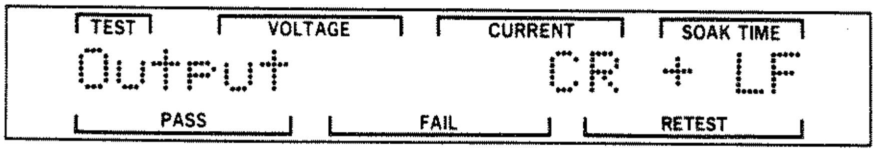


Figure 3-132. Output Screen

The 5300 can communicate using the ASCII character CR, ASCII character LF, or CR + LF at the end of each line. The selection of the desired line terminator is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.2.3.7 XON/XOFF Screen

The XON/XOFF screen is displayed by pressing the DOWN pushbutton when the Output screen is displayed. Figure 3-133 is an example of this screen.

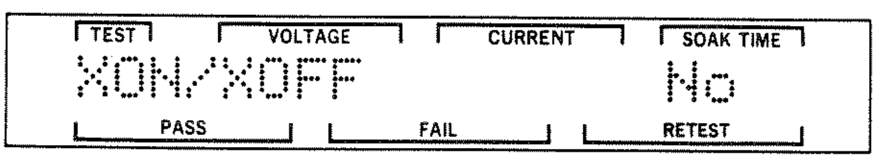


Figure 3-133. XON/XOFF Screen

The 5300 can communicate using either hardware or software handshaking to prevent input buffer overflow. If software handshaking is desired, XON/XOFF must be set to Yes. (Hardware handshaking is always left on.) The selection of this mode is made by pressing the INC or DEC pushbutton when this screen is displayed.

3.7.2.3.8 Printer Screen

The Printer screen is displayed by pressing the DOWN pushbutton when the XON/XOFF screen is displayed. Figure 3-134 is an example of this screen.

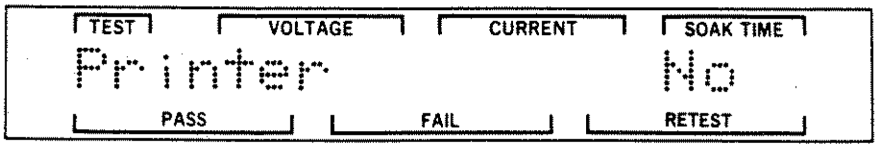


Figure 3-134. Printer Screen

There are several reports that can be sent to a printer by the 5300. If the serial interface is to be used to communicate with a printer, this interface must be selected for that purpose. This is accomplished by setting this screen to Yes and by selecting Serial on the Interface Select screen. When printer is selected, the interface is designated as output only and can't be used to control the 5300. For more information on selecting the serial interface for use with a printer, refer to Setting Printer Parameters, Section 7.9.2. For more information on the available printed reports, refer to Printer Output Screens, Section 3.4.3.5, and Print Configuration Screen, Section 3.4.5.12.2.

3.7.2.4 Pin Assignments

The 5300 RS-232C Interface uses a male DB-25 connector located on the rear of the interface that follows the EIA RS-232C standard. The electrical installation of this interface consists of constructing a cable to connect the interface to the (DTE) computer. Information regarding the construction of this cable is contained in this section.

The cable must have a female DB-25 connector at the 5300 end. An Amphenol 17-80250-15 or equivalent should work properly.

Instrument configuration for use with RS-232C consists of setting several communication parameters. Refer to Serial, Section 3.7.2, for information on setting these parameters.

Before constructing the RS-232C cable, the type of handshaking (software or hardware) to be used must be determined.

If software handshaking is selected, the cable requires only three wires and two jumpers. Table 3-22 identifies these connections. Figure 3-135 is a schematic of a software configured cable.

> **NOTE:** Connecting the DTR and DSR lines together will cause the RS-232C Interface to appear to be active. This will prevent access to the individual Serial screens while the cable is connected. Access can be gained to these screens by disconnecting the RS-232C cable assembly from the 5300.

Table 3-22. RS-232C Cable Wiring for Software Handshaking

5300 PIN	NAME	COMPUTER PIN	NAME	NOTES
7	SG	7	SG	Signal Ground
2	TD	3	RD	Data from 5300 to computer
3	RD	2	TD	Data from computer to 5300
6	DSR			Connect these two together
20	DTR			
1	FG	1	FG	Frame Ground, optional connection

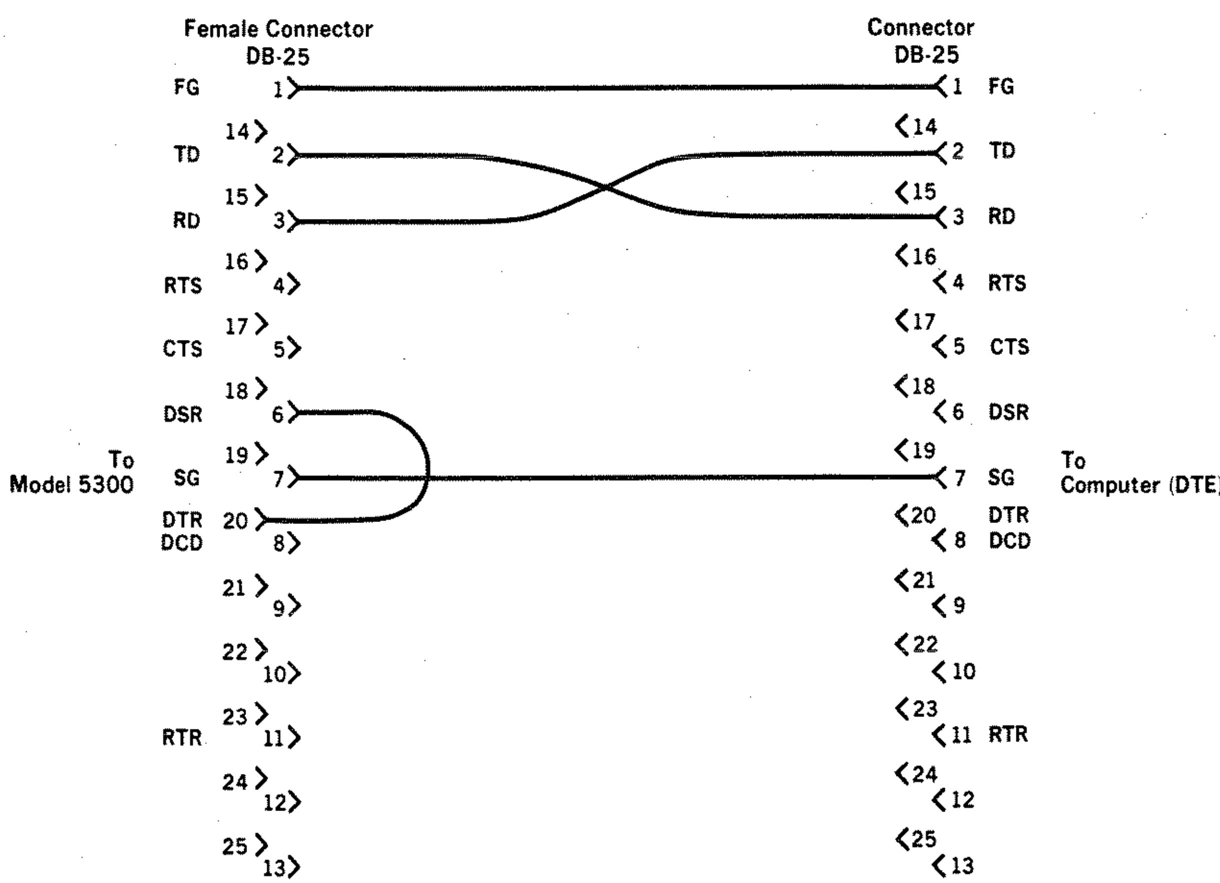


Figure 3-135. RS-232C Cable Wiring for Software Handshaking

If hardware handshaking is selected, a different set of connections is required. Table 3-23 identifies these connections. Figure 3-136 is a schematic of a hardware configured cable.

Table 3-23. RS-232C Cable Wiring for Hardware Handshaking

5300 PIN	NAME	COMPUTER PIN	NAME	NOTES
7	SG	7	SG	Signal Ground
2	TD	3	RD	Data from 5300 to computer
3	RD	2	TD	Data from computer to 5300
6	DSR	20	DTR	Allows each device to detect that the other is active
20	DTR	6	DSR	
4	RTS	8	DCD	Allows hardware handshaking
5	CTS	11	RTR	
8	DCD	4	RTS	
11	RTR	5	CTS	
1	FG	1	FG	Frame Ground, optional connection

Sample and Log Commands for Statistical Analysis

Sample" and "Log" commands allow the 5300 to store every Nth test .t and control how those test results are communicated between the and the controller. The 5300 performs no statistical analysis :ts. It only provides the sampled test results for you to analyze.

"Sample", "Log", "Buffer", and "Result" commands are always used ther. The "Sample", "Buffer", and "Result" commands are easy to erstand and straightforward. Different combinations of the other nands have no effect on them. However, the two different binations of the "Log" command parameters determine how test result a is transfered between the 5300 and the controller, and how the t results are stored in the 5300 buffer.

h "Log" command is designed for a specific application. The "Log " command should be used when you want all the sampled test results m the batch of parts you're testing and; You are not concerned with wing down the system to transmit the test results to the controller. e "Log Some" command should be used when speed is the number one sue and you only are concerned with sampling a small portion of a tch of parts. See definition of "Log Some" and "Log All" in Table 30 for futher information.

For an example of how you would issue these commands for a batch of components where:

- The controller will be using GPIB communication
- Tests will be initiated by a smart handler
- Every 25th part will be sampled and the data will be sent to the controller in groups of 20

```
Input>    Log All
          Sample 25
          Buffer 20
          Allow Handler
```

After 500 parts have been tested the buffer will contain 20 test results. Because we are using GPIB communication, the 5300 will set the SRQ line, indicating the 5300 has some information for the controller. After the 5300 has been polled, the controller must send an "R" (Result) command to the 5300 to receive the test results.

> **NOTE:** If you are using RS-232C communication with the controller, the "R" command is automatically issued by the 5300, and the test results are sent to the controller when the queue fills to the programmed value.

Table 3-30. Sample and Log Commands for Statistical Analysis

COMMAND SYNTAX	PARAMETER	FUNCTION AND 5300 RESPONSE
Logging (LOG)	Name,	Controls how test result data is handled when it is logged into the 5300's buffer (the buffer will hold 64 test results). This command is used in conjunction with the Sample, Buffer, and Result commands. The 5300 will log every Nth test result according to the Sample command and output test results by command R in a format set by the Buffer command.
	None	Disables LOG function. 5300 will not log any test results.
	All	Enables LOG function. The 5300 will log every Nth test result set by the Sample command. When the test result buffer is full (64 test results), the 5300 will not allow any more tests until an R (Result) command is issued to empty some of the buffer.
	Some	Enables LOG function. The 5300 will log every Nth test result set by the Sample command. Unlike the All parameter, the Some parameter will allow new test results to be added to the test result string once the buffer is full. The oldest test results are removed from the buffer as new test results are added at the end of the test result string. For example: The buffer has stored test results 1 - 64. Then four more tests are initiated. Now the buffer contains test results 5 - 68.
Sample (SA)	Integer, 1 - 100	Used with LOG command. The 5300 wil log every Nth test result as set by the Sample command parameter. Example: SA 10 will log every 10th test result into the 5300's buffer.

Table 3-30. Sample and Log Commands for Statistical Analysis (Continued)

COMMAND SYNTAX	PARAMETER	FUNCTION AND 5300 RESPONSE
Buffer (BU)	Integer, 1 - 20	Used with LOG, Sample, and Result commands. The 5300 will output N test results defined by the buffer parameter. Example: BU 20 will output a string of 20 test results when an R (Result) command is issued. When using the GPIB interface, SRQ is set when the number of stored test results equals the Buffer command parameter. SRQ is reset when the number of stored test results is lower than the Buffer command parameter. When using the RS-232C interface, an R (Result) command is automatically issued by the 5300 when the number of test results equals the Buffer command parameter.
Result (R)		Used with LOG, Sample, and Buffer commands. Returns up to N test results (N is set by the Buffer parameter) that are logged into the 5300 buffer. NOTE: When using the Allow command, the only valid command syntax for Result is R. Using the spelled out version, "Result", will cancel the Allow command.

3.8.7 Remote Programming Examples

This section provides two examples. One example illustrates how to sequence the commands when the 5300 is used with an ESI Test Fixture. The second example is a program written in pseudo-BASIC, where the 5300 is used with a smart handler and the controller is using GPIB communication.

3.8.7.1 Example 1 - Sequencing 5300 Commands

This example will show how to sequence the control commands from a controller to the 5300 using an ESI Test Fixture. The part you are going to test has a value of 0.05 uF with a 100V working voltage. The part has a gigaohm of leakage (worst case), so you will test this part at five times the working voltage.

Example - 1 Sequencing 5300 Commands

NOTE: Before entering the Remote Mode, configure the 5300 to match your setup application.

First you must gain control of the 5300. Set the front panel key switch to ENABLE, then:

```
Input>   MASTER 1

Output>  MASTER 1
```

Input the capacitor setup parameters. Always precede these commands with a "Bin Count Zero" command to reset the bin count registers. If there are any counts in these registers you can not enter new setup parameters. The setup commands you are going to enter are:

Stress Voltage = 500 Volts
Stress Leakage = 1.0 uA
Stress Time = 1.0 s
Check Voltage = 50 Volts
Check Leakage = 1.0 uA
Check Time = 1.0 s
Rate Current = 50 mA
Nominal Capacitance = 50 nF

```
Input>   BCZ;SV 500;SLC 1u;SST 1;CV 50;CLC 1u;CST 1;RC .05;NC 50n

Output>  BCZ;SV 0500.;SLC .000001;SST 001.00;CV 50.;CLC.000001;
         CST 001.00;RC .0500;NC 51n
```

You will want to log each test result and have them returned to the controller (terminal or PC) in groups of 10.

```
Input>   LOG ALL;SAMPLE 1;BUFFER 10

Output>  LOG ALL;SAMPLE 1;BUFFER 10
```

If you are using an ESI Test Fixture it automatically sends a trigger when the hood is closed. In this case you have to allow the fixture control.

```
Input>   ALLOW FIXTURE

Output>  ALLOW FIXTURE
```

Now you can test some parts. With the ESI Test Fixture simply open the cover, insert the part, and close the cover. The test is initiated when the cover is closed. After 10 tests have been performed, the test results are ready to be sent from the 5300 to the controller.

If you are using RS-232C, the 5300 will automatically generate an "R" (Result) command and send the test results.

```
Output>  R PAS,PAS,PAS,PAS,PAS,PAS,PAS,PAS,PAS,PAS
```

If you are using GPIB, the 5300 will set SRQ as an indication the buffer is full. You then must sent the "R" command to the 5300 to get the test results.

```
Input>   R

Output>  R PAS,PAS,PAS,PAS,PAS,PAS,PAS,PAS,PAS,PAS
```

3.8.7.2 Example 2 - Pseudo-BASIC Program Using Smart Handler and GPIB

In this example, the controller is using an IEEE-488 interface. The program is written in pseudo-BASIC, meaning the command names or syntax may be different when using BASIC program packages from different manufacturers. This program is only intended to give a programmer the feel of how to structure their application program.

The program is designed to get the component setup parameters from a temporary file and load them into the 5300, lend control to a smart handler, and log test results into a disk file. The main loop routine looks for SRQ from the 5300 to be set, which means the buffer is full and ready to send the test results. The program is exited by entering the character "D" from the controller keyboard.

Example 2 - Pseudo-BASIC Program

NOTE: This is not a functional program, it is only intended to give a programmer the feel of how to structure their application program.

```
! Open the CRT and keyboard

    FILE#1,"CON:","Interactive,Character,Noecho"
    PUT#1,CHR$(12);  ! Clear screen
    PUT#1,GOXY$(30,4);  ! Move to center of screen
    PUT#1,"5300 Demonstration Program"

! Get parameters out of disk file

    FILE#2,"5300.TMP","Input,Line"  ! Input line-oriented file
    GET#2,StressVoltage
    GET#2,StressTime
    GET#2,StressCurrent
    GET#2,CheckVoltage
    GET#2,CheckTime
    GET#2,CheckCurrent
    GET#2,RampCurrent
    GET#2,NominalCapacitance
    FILE#2  ! Done with disk file

! Show everything on screen

    PUT#1,GOXY$(10,7),"Stress Voltage = ",StressVoltage
    PUT#1,GOXY$(10,8),"Stress Time = ",StressTime
    PUT#1,GOXY$(10,9),"Stress Current = ",StressCurrent
    PUT#1,GOXY$(10,10),"Check Voltage = ",CheckVoltage
    PUT#1,GOXY$(10,11),"Check Time = ",CheckTime
    PUT#1,GOXY$(10,12),"Check Current = ",CheckCurrent
    PUT#1,GOXY$(10,13),"Ramp Current = ",RampCurrent
    PUT#1,GOXY$(10,14),"Nominal Capacitance = ",NominalCapacitance

! Build 5300 string (note >< is concatenate operator)

    LET X$ = "BCZ"  ! Zero bin counts
    LET X$ = X$ >< ";SV " >< StressVoltage
    LET X$ = X$ >< ";ST " >< StressTime
    LET X$ = X$ >< ";SC " >< StressCurrent
    LET X$ = X$ >< ";CV " >< CheckCurrent
    LET X$ = X$ >< ";CT " >< CheckTime
    LET X$ = X$ >< ";CC " >< CheckCurrent
    LET X$ = X$ >< ";RC " >< RampCurrent
    LET X$ = X$ >< ";NC " >< NominalCapacitance

! Open GPIB (5300 is addressed as 00001 on GPIB)

    FILE#2,"GPIB:1","device,message"  ! REN turned on here too
```

Example 2 - Pseudo-BASIC Program (Continued)

NOTE: This is not a functional program, it is only intended to give a programmer the feel of how to structure their application program.

```
! Wait till we can see 5300 on the bus

    LOOP
        CNTRL#2,R$,"SerialPoll"  ! Poll 5300 to see if alive
    WHILE Left$(R$,1) = "!"      ! Exclamation signals error
        PUT#1,GOXY$(30,22),"5300 not present on GPIB";
    ENDLOOP
    PUT#1,GOXY$(30,22),DUP$(" ",20);  ! Clear error message

! Take control of 5300

    PUT#2,"MASTER 1"
    GET#2,R$
    IF R$="MASTER 2"
        PUT#1,GOXY(30,22),"Waiting  for Control of 5300"
        LOOP
            WAIT
            CNTRL#2,R$,"Serial Poll"
        UNTIL Left$(R$,1)="1"  ! DIO8=1 means Master now
        ENDLOOP
    ENDIF
    PUT#1,GOXY$(30,22),DUP$(" ",20);  ! Clear error message

! Send 5300 our component setup parameters

    PUT#2,X$
    GET#2,R$
    IF ANY?(R$,"!")
        PUT#1,GOXY$(30,21),"Error Setting Test Parameters";
        PUT#1,GOXY$(30,22),"Maximum Voltage Probably Wrong";
        PUT#1,GOXY$(30,23),R$
        ERROR("TYPE") ! Terminate program with error
    ENDIF

! Set up Sample and Logging for test result data

    PUT#2,"LOG ALL;SAMPLE 25;BUFFER 20"
    GET#2,R$
    IF ANY?(R$,"!")
        PUT#1,GOXY$(30,22),"Error in Log, Sample, or Buffer Command";
        PUT#1,GOXY$(30,23),R$
        ERROR("BCE")  ! Terminate program with error
    ENDIF
```

Example 2 - Pseudo-BASIC Program (Continued)

NOTE: This is not a functional program, it is only intended to give a programmer the feel of how to structure their application program.

```
! Lend control to smart handler - be certain handler configuration
! is set to SMART

    LOOP
         PUT#2,"LEND HANDLER"
         GET#2,R$
    WHILE Left$(R$,1)="!"
         PUT#1,GOXY$(30,22),"Error in Lend Command";
    ENDLOOP
    PUT#1,GOXY$(30,22),DUP$(" ",20);

! Main loop for gathering test results and monitoring keyboard entry
! of D to terminate program

    LET Accum=TABLE(0)  ! SNBOL/ICON style table
    LOOP
         WAIT
         CNTRL#2,R$,"SRQ"
         IF R$="1"
              PUT#2,"R"  ! Buffer is full, get test results from 5300
              GET#2,R$
              IF Left$(R$,1)<>"R"="R"  ! Nothing?  SRQ error?
              ELSEIF Left$(R$,2)="R " Yes buffer was full
                   R$=Right$(R$,-1)      ! Kill the R, leave the space
                   LOOP WHILE R$<>""
                        R$=Right$(R$,-1) ! Kill the comma/space
                        T$=Left$(R$,3)   ! Extract result code
                        R$=Right$(R$,-3) ! Kill code
                        Accum(T$)=Accum(T$)+1
                   ENDLOOP
              ENDIF
         ENDIF
         CNTRL#1,R$,"KReady"  ! Any input from keyboard
         IF R$="1"
              GET#1,R$          ! Get character from keyboard
              IF R$="D"
                   GOTO done  ! Exit main loop
              ELSE
                   PUT#1,CHR$(7); ! Ding
              END IF
         ENDIF
    ENDLOOP
    LABEL done     ! Should do one last R command to catch stragglers
    File#2  ! Close GPIB channel
```

Example 2 - Pseudo-BASIC Program (Continued)

NOTE: This is not a functional program, it is only intended to give a programmer the feel of how to structure their application program.

```
! Output results to disk file

     FILE#2, "5300.LOG", "New"  ! Open disk file
     FOR R$ IN Accum            ! Scan each entry
          PUT#2,R$,",",Accum(R$)
     ENDFOR
     FILE#2  ! Close Disk File
```

NOTE: TABLE looks like an array which takes anything as a subscript. This effectively creates a symbol table (a phone book is a symbol table). The FOR statement steps through the subscripts of the table. ANY? is a function that looks at the character in the second argument and sees if it is present anywhere in the first argument.

SECTION 4
MODULE DESCRIPTIONS

4.1 INTRODUCTION

The electronics of the 5300 are found primarily on the following circuit assemblies: CPU, High Voltage, Low Voltage, Display, Test Point, Fuse Board, Switch Board, and Digital Bus. The location and general function of each of these assemblies and their sub-assemblies are covered in this section.

A block diagram of these assemblies is provided as Figure 4-1.

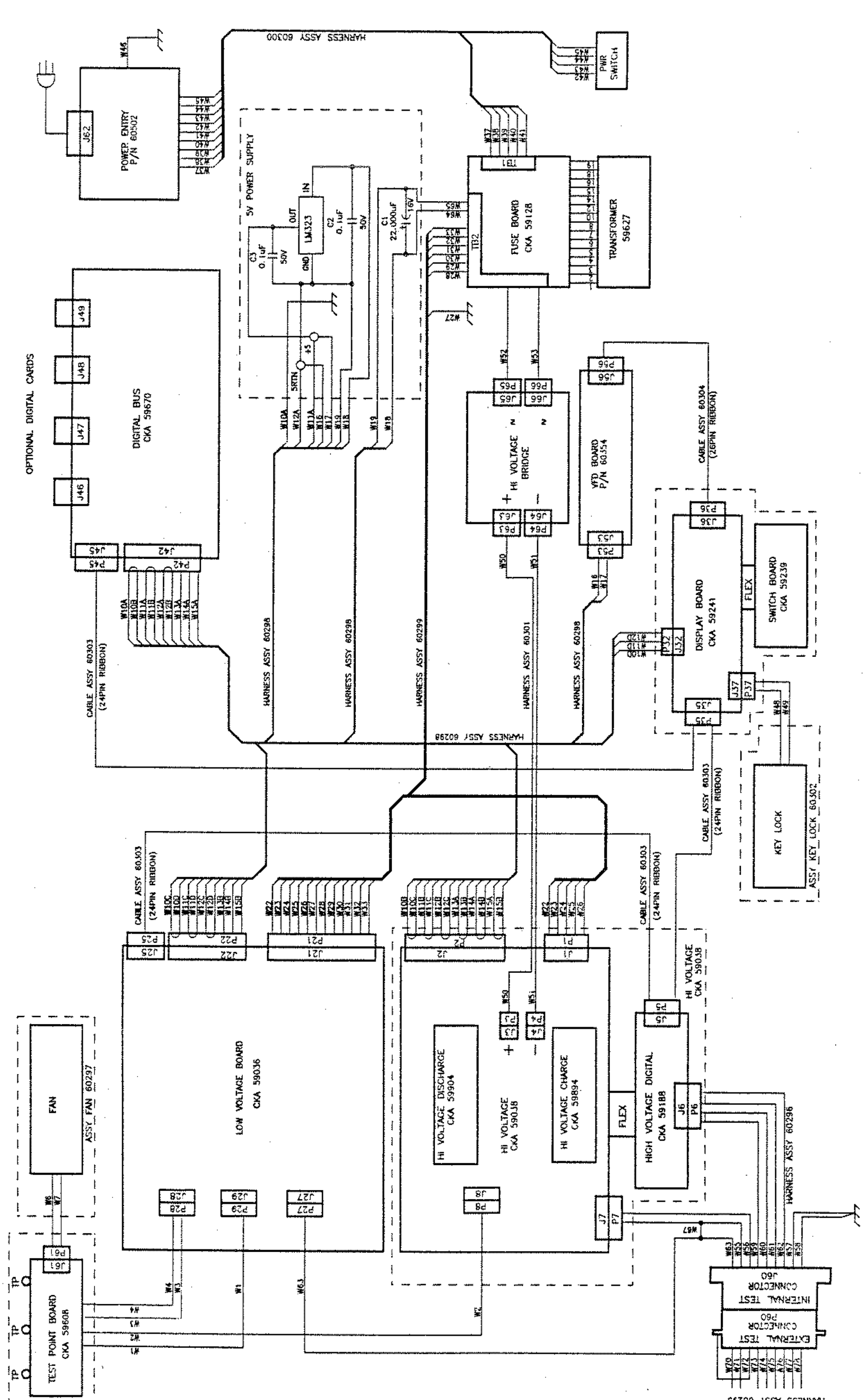


Figure 4-1. System Block Diagram

4.2 CPU CIRCUIT ASSEMBLY (P/N 57709)

The CPU circuit assembly plugs into one of the slots of the card cage in the rear of the 5300, as shown in Figure 4-2. The primary function of this circuit assembly is to control the other circuit assemblies in the 5300. Guided by software located in a PROM, the CPU circuit assembly analyzes the information provided by the other circuit assemblies and controls them accordingly. Information programmed by the user, accumulated test results, and calibration information are stored on the CPU circuit assembly in battery backed-up RAM, allowing the information to be retained even when the power is disconnected. An LED on this circuit assembly is illuminated when the CPU is functioning. This LED is visible through a hole in the bracket that secures the circuit assembly.

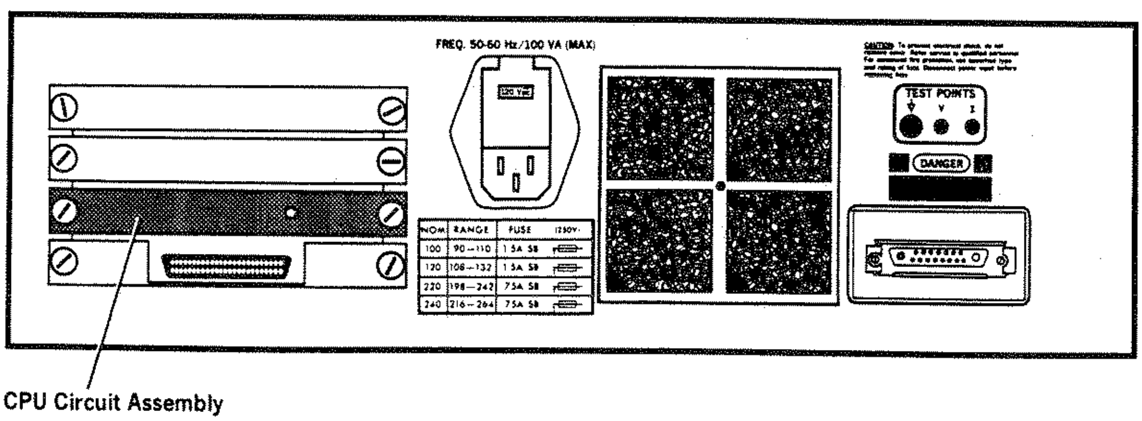


Figure 4-2. Location of CPU Circuit Assembly (P/N 57709)

4.3 HIGH VOLTAGE CIRCUIT ASSEMBLY (P/N 59038)

The High Voltage circuit assembly is located at the bottom of the instrument, as shown in Figure 4-3. Attached to this circuit assembly are three other circuit assemblies: High Voltage Charge, High Voltage Discharge, and the High Voltage Digital. These three circuit assemblies are discussed in the following sections.

The High Voltage circuit assembly (including the three assemblies attached to it) operates primarily during the Stress test. The discharge circuitry is also used during the Check test.

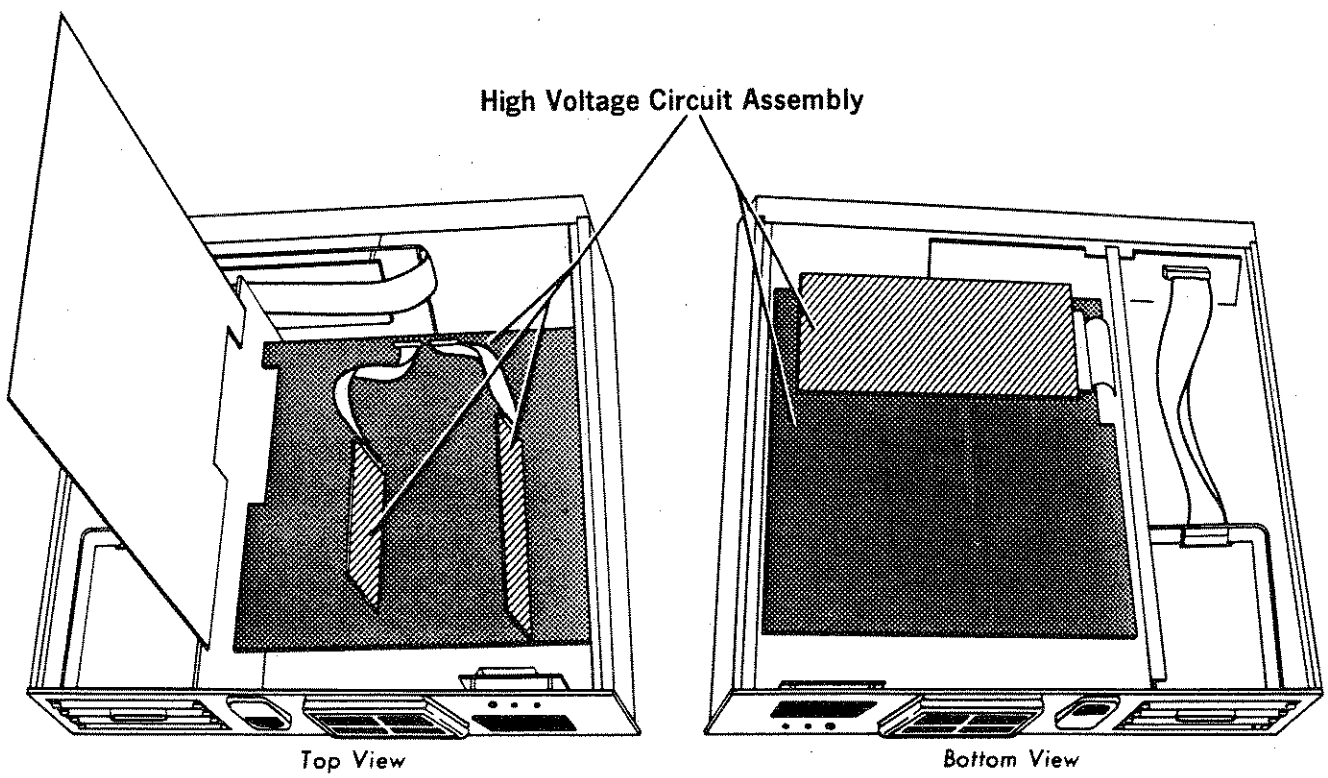


Figure 4-3. Location of High Voltage Circuit Assembly (P/N 59038)

4.3.1 High Voltage Digital Circuit Assembly (P/N 59188)

The High Voltage Digital circuit assembly is located underneath the High Voltage circuit assembly, as indicated in Figure 4-4. It has two main functions: to provide an interface between the High Voltage circuit assembly and the Digital Bus (to the CPU); and to control the High Voltage circuit assembly.

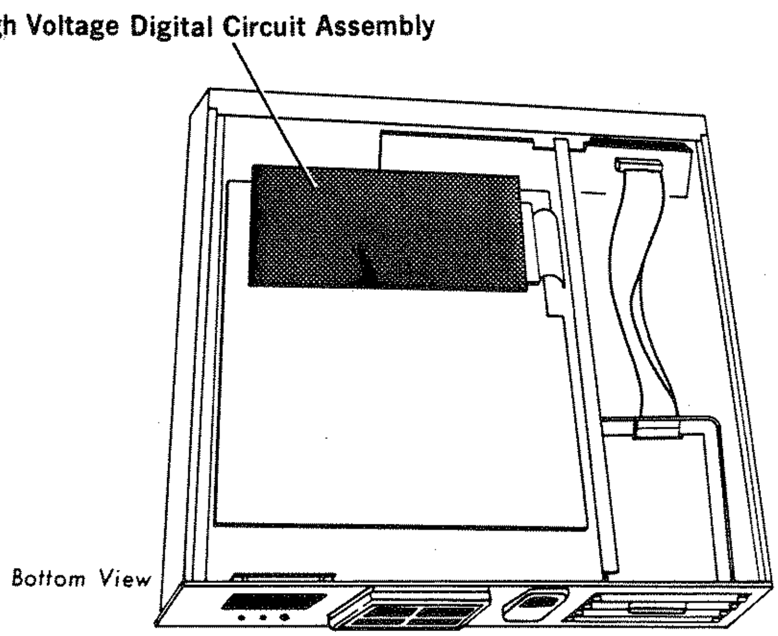


Figure 4-4. Location of High Voltage Digital Circuit Assembly (P/N 59188)

4.3.2 High Voltage Charge Circuit Assembly (P/N 59894)

The programmable High Voltage Charge circuit assembly is attached to the component side of the High Voltage circuit assembly, as indicated in Figure 4-5. Its function is to charge the DUT to the Stress voltage at the selected constant-current rate.

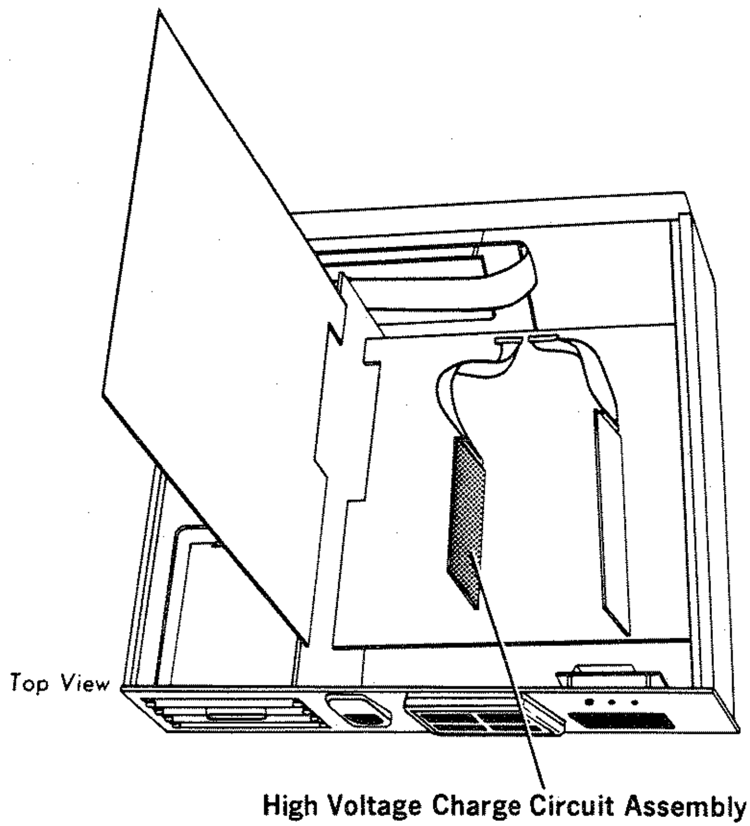


Figure 4-5. Location of High Voltage Charge Circuit Assembly (P/N 59894)

4.3.3 High Voltage Discharge Circuit Assembly (P/N 59904)

The programmable High Voltage Discharge circuit assembly is attached to the component side of the High Voltage circuit assembly as indicated in Figure 4-6. Its function is to discharge the DUT at the same constant-current rate as selected for charging. In addition, this circuit assembly contains the control circuitry for the High Voltage Power Supply.

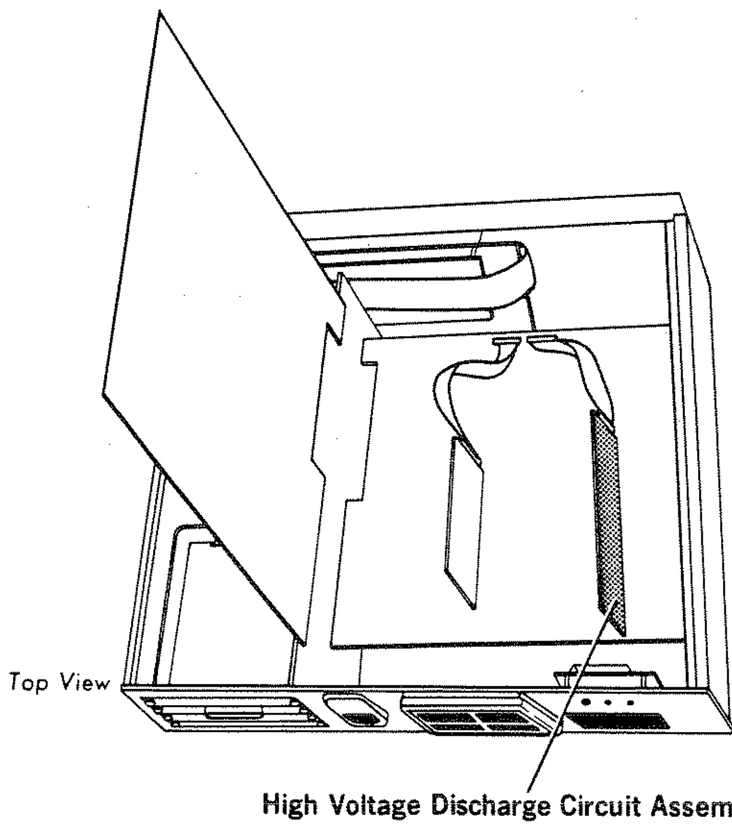


Figure 4-6. Location of High Voltage Discharge Circuit Assembly (P/N 59904)

4.4 LOW VOLTAGE CIRCUIT ASSEMBLY (P/N 59036)

The Low Voltage circuit assembly is located above the High Voltage circuit assembly, as shown in Figure 4-7. This circuit assembly provides regulated power to other circuit assemblies, controls the Check Test, and provides the Sense circuit to measure DUT current.

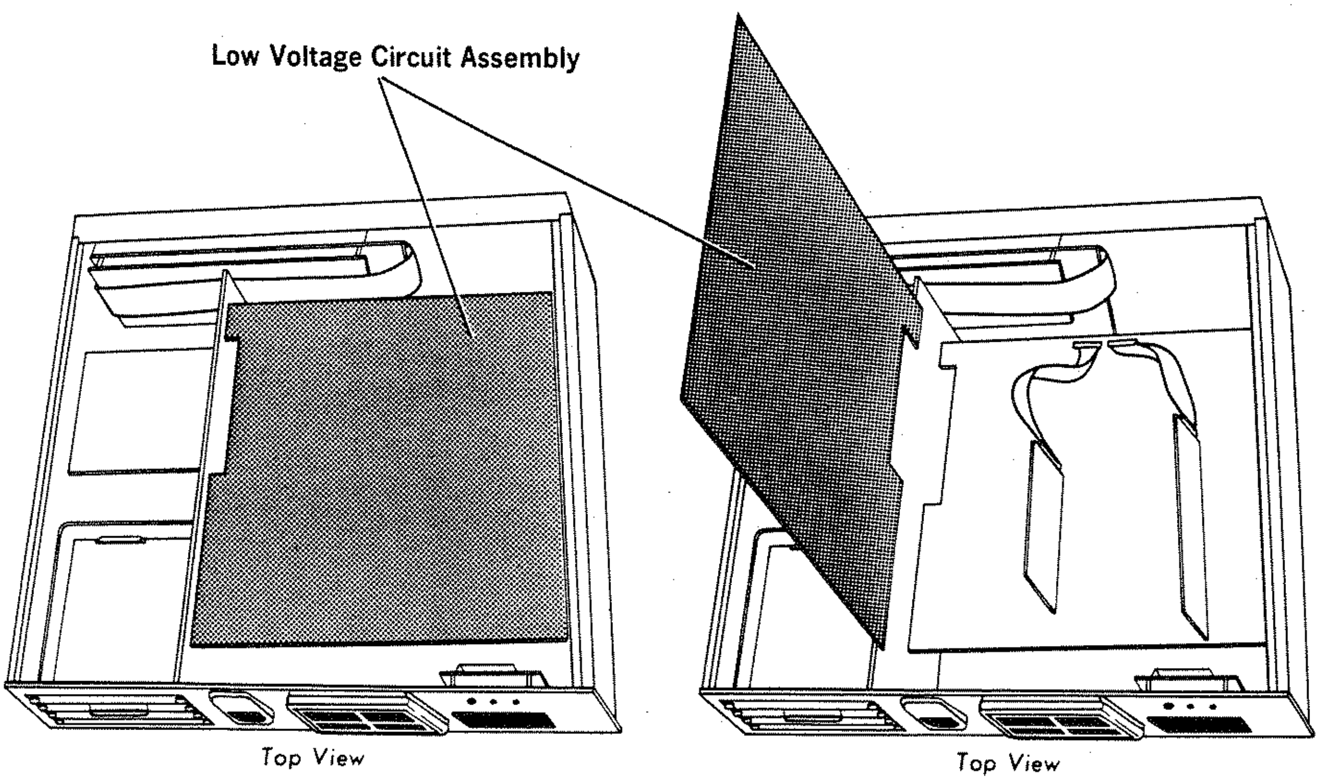


Figure 4-7. Location of Low Voltage Circuit Assembly (P/N 59036)

4.5 DISPLAY CIRCUIT ASSEMBLY (P/N 59241)

The Display circuit assembly is located behind the front panel, as indicated in Figure 4-8. This circuit assembly supports the 20-character display and the Switch Board circuit assembly (discussed in the next sections) and provides an interface between the display and the Digital Bus (to the CPU) and between the Switch Board circuit assembly and the Digital Bus.

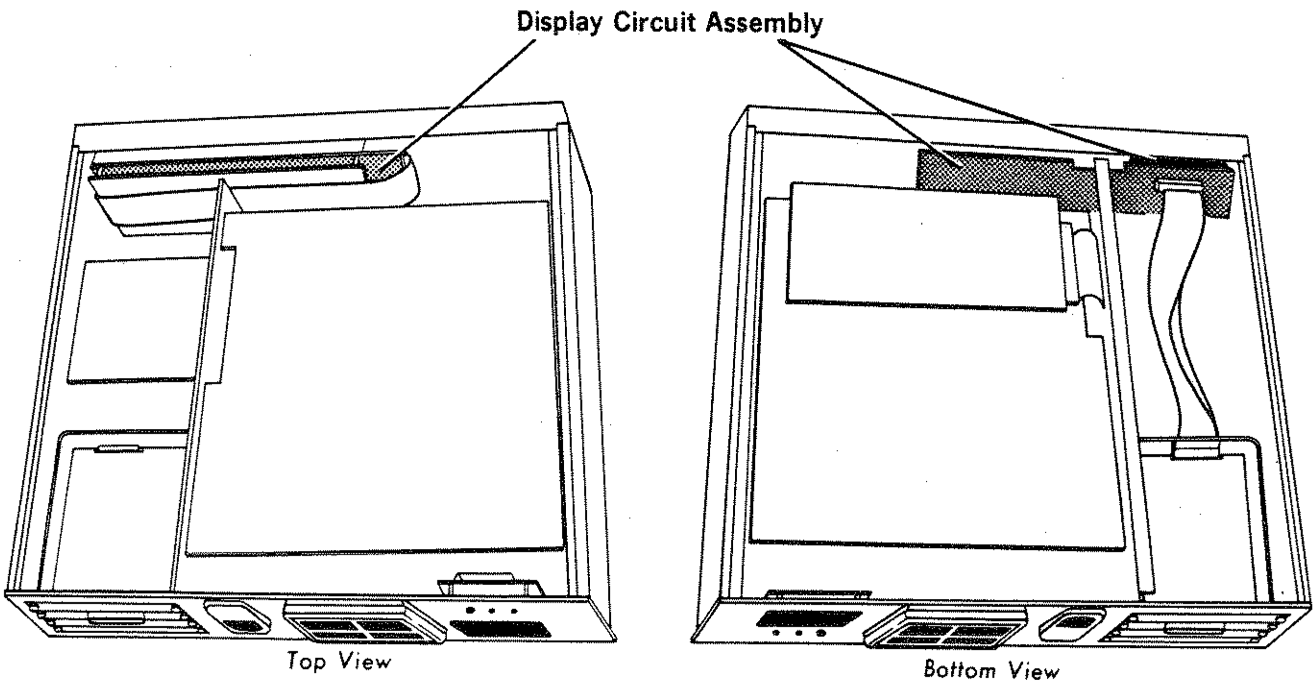


Figure 4-8. Location of Display Circuit Assembly (P/N 59241)

4.5.1 Switch Board Circuit Assembly (P/N 59239)

The Switch Board circuit assembly is located behind the front panel, as shown in Figure 4-9. This circuit assembly supports the front panel LEDs and pushbuttons.

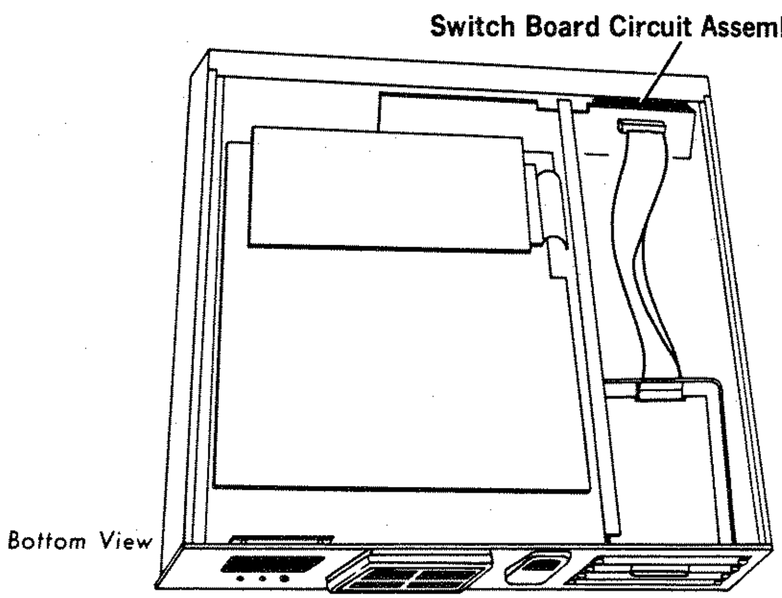


Figure 4-9. Location of Switch Board Circuit Assembly (P/N 59239)

4.6 20-CHARACTER DISPLAY ASSEMBLY (P/N 59626)

The 20-Character Display assembly is located behind the Display circuit assembly, as shown in Figure 4-10. The vacuum fluorescent display tube that is visible through the front panel window is part of this assembly. In addition, the driving and decoding circuitry for the display tube is contained in this assembly. This assembly allows the instrument to communicate with the user with alpha-numeric characters.

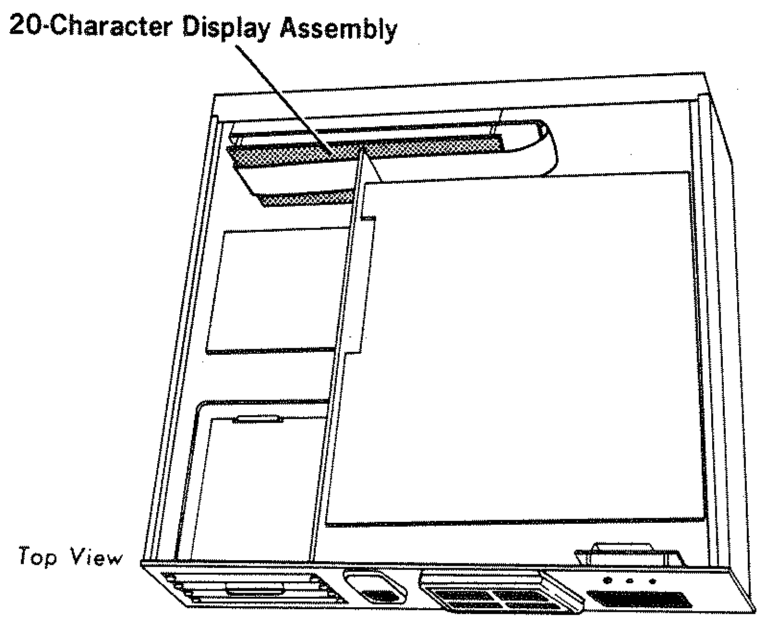


Figure 4-10. Location of 20-Character Display Assembly (P/N 59626)

4.7 TEST POINT CIRCUIT ASSEMBLY (P/N 59608)

The Test Point circuit assembly is attached to the rear panel, as indicated in Figure 4-11. It provides connector pins that carry signals that must be monitored for some instrument calibrations. These pins can be accessed through the rear panel.

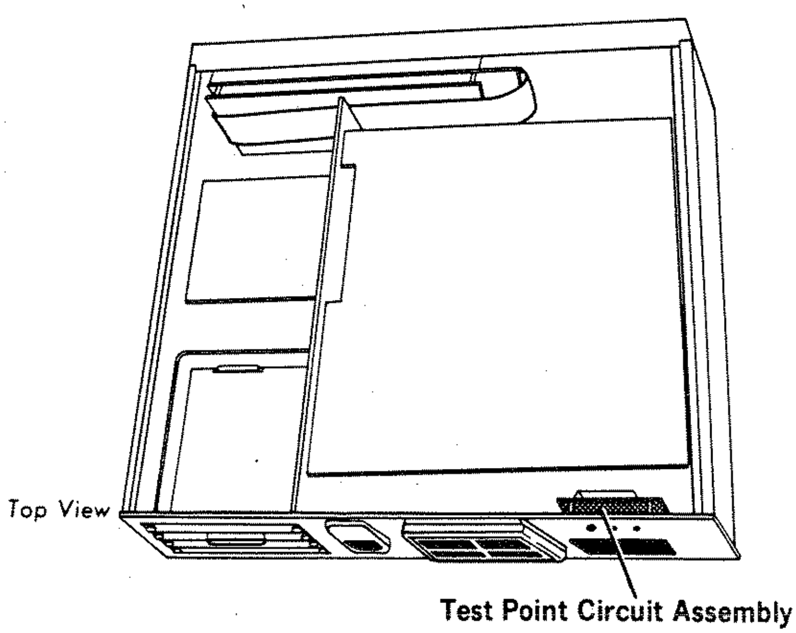


Figure 4-11. Location of Test Point Circuit Assembly (P/N 59608)

4.8 FUSE CIRCUIT ASSEMBLY (P/N 59128)

The Fuse circuit assembly is located in front of the enclosure for the CPU and interface circuit assemblies, as shown in Figure 4-12. This circuit assembly contains the internal fuses for the secondary side of the power transformer, located underneath this circuit assembly. These fuses do **not** need to be changed when the line voltage is changed. Fuses in the power entry module on the rear panel are on the primary side of the power transformer and must be changed with the line voltage. Refer to LINE POWER CONNECTION, Section 7.2.

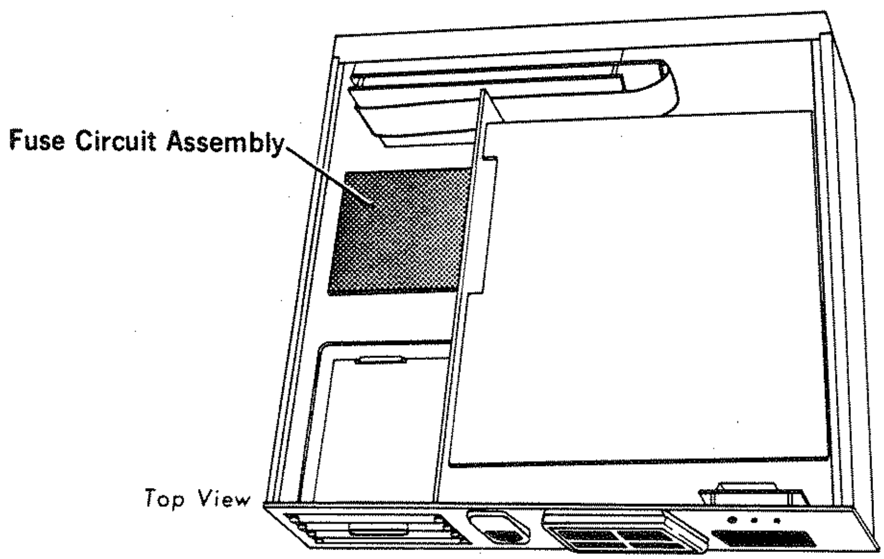


Figure 4-12. Location of Fuse Circuit Assembly (P/N 59128)

4.9 DIGITAL BUS CIRCUIT ASSEMBLY (P/N 59670)

The Digital Bus circuit assembly is located on the front side of the enclosure for the CPU and interface circuit assemblies, as shown in Figure 4-13. This circuit assembly supports one connector for each possible location for a circuit assembly in the enclosure.

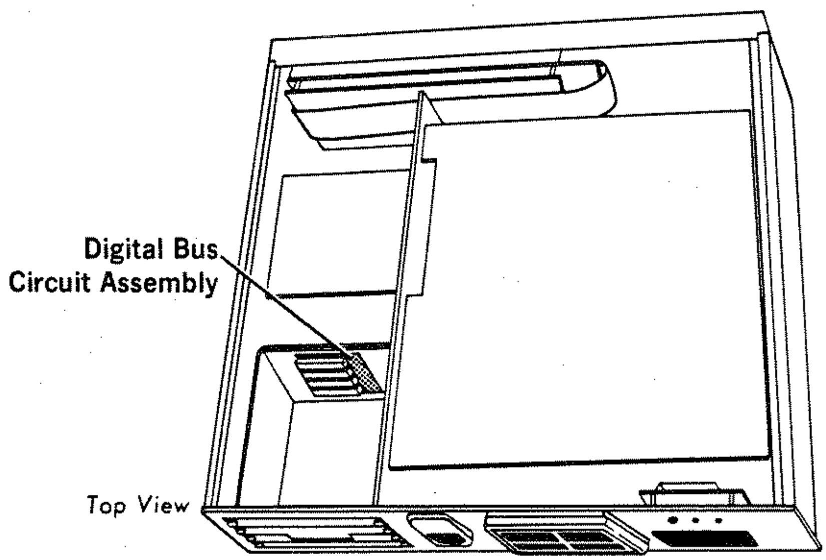


Figure 4-13. Location of Digital Bus Circuit Assembly (P/N 59670)

SECTION 5
PERFORMANCE VERIFICATION, CALIBRATION, AND MAINTENANCE

5.1 PERFORMANCE TEST

A performance test should be performed on the 5300 every 6 months. This will verify that the instrument is performing properly.

In addition to the standard calibrations, two performance tests should be performed: leakage current accuracy and DUT test signal. The following sections describe these procedures.

5.1.1 Leakage Current Accuracy Verification

This test provides verification of the DUT leakage current measurement accuracy of the 5300. A capacitor is connected in parallel with a decade resistor and the combination is connected in series with a microammeter. This network is connected as a DUT to the 5300. A test with a long Stress soak time is selected and initiated. The actual leakage current can be read on the microammeter and adjusted (between tests) by changing the value of the decade resistor. By conducting many tests and observing the result of each test, the pass/fail threshold can be identified. Comparing this threshold (as measured on the microammeter) to the programmed Stress leakage current identifies the leakage current measurement accuracy.

5.1.1.1 Equipment Required

The following equipment is required for this performance test:

Known-good capacitor, 10 picofarad to 100 picofarad, 5%, ceramic or film, 100 volt (or greater)
Decade resistance box, 1.2 megohm maximum, 1 kilohm steps, 1% accuracy
Ammeter, 200 microampere range with 1 microampere resolution and 2 milliampere range with 10 microampere resolution, 1% accuracy

5.1.1.2 Procedure

The following procedure describes a method for verifying the accuracy of the leakage current comparison at 100 microamperes and at 1 milliampere. Other values of leakage current can be tested by changing the values selected on the decade resistance box.

STEP 1. Press the POWER pushbutton to turn the 5300 to 1 (on). Allow the instrument to warm up for at least 10 minutes.

STEP 2. Adjust the decade resistor for a value of 1 megohm. Adjust the microammeter for a range of 200 microamperes.

STEP 3. Connect the decade resistance box and the capacitor in parallel. Connect one lead of the ammeter to one side of this parallel combination. Refer to Figure 5-1.

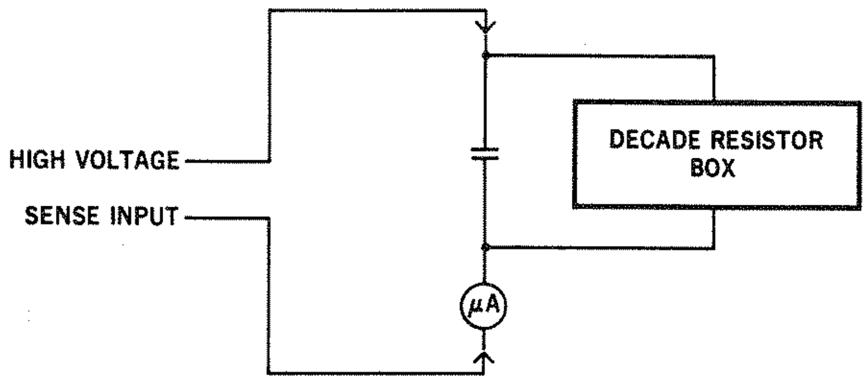


Figure 5-1. Connections for Leakage Current Accuracy Verification

STEP 4. Connect the other lead of the ammeter to the Sense Input probe on the test head. Refer to Figure 5-1.

STEP 5. Connect the other side of the parallel combination (the side **not** connected to the ammeter) to the High Voltage probe on the test head. Refer to Figure 5-1.

STEP 6. Close the test head cover. Observe that the INTERLOCK LED on the 5300 turns off.

STEP 7. Set the test conditions as shown in Table 5-1. For information on setting these conditions, refer to Set Mode, Section 3.5.4.

Table 5-1. Performance Test Conditions

Stress Voltage	100 V
Stress Leakage Current	100 uA
Stress Soak Time	1.0 s
Check Voltage	50 V
Check Leakage Current	10 mA
Check Soak Time	0 ms
Nominal Value	Value of capacitor
Charge Rate	50 mA

DANGER

THE FOLLOWING STEP PLACES A POTENTIALLY LETHAL VOLTAGE ON ONE SIDE OF THE DUT. THE DECADE RESISTOR AND AMMETER ARE CONNECTED TO THIS VOLTAGE. EXTREME CAUTION MUST BE FOLLOWED TO VERIFY THAT THE PROPER TEST CONDITIONS HAVE BEEN SELECTED AND THAT CONTACT WITH THE AMMETER OR DECADE RESISTOR WILL NOT OCCUR. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

STEP 8. With the access keyswitch in the ENABLE position, initiate a test. When the test is complete (indicated by the TEST LED turning off and the READY LED illuminating), either the PASS LED or the St FAIL LED should illuminate. Observe (and record) which LED is illuminated. Perform this step four more times, for a total of five tests.

NOTE: For information about initiating a test, refer to TEST CABLE ASSEMBLY, Section 7.4, (Handler Interface) Control Inputs, Section 3.6.2.2, or COMMUNICATION INTERFACES, Section 3.7.

STEP 9. If any of the five test results were St FAIL, increase the value of the decade resistor by 1 kilohm and repeat the preceding step. Once five successive tests have been performed with **no** St FAIL results, proceed to the next step.

STEP 10. Decrease the value of the decade resistor by 1 kilohm and initiate five tests. Record the results of the tests.

STEP 11. Repeat the last step until at least one result is St FAIL.

STEP 12. The lower threshold of the leakage current limit has been located. Perform one test and observe the maximum reading on the microammeter. It may be necessary to increase the Stress Soak Time to allow the microammeter to settle. Record the value indicated on the microammeter.

STEP 13. Decrease the value of the decade resistor by 1 kilohm and initiate five tests. Record the results of the tests.

STEP 14. Repeat the last step until all test results are St FAIL.

STEP 15. The upper threshold of the leakage current limit has been located. Perform one test and observe the maximum reading on the microammeter. Record this value.

STEP 16. Both of the recorded current values should be within the leakage current specification (+/-5%) of the value for Stress Leakage Current. Using a Stress Leakage Current of 100 microamperes, the recorded values must be between 95 and 105 microamperes.

STEP 17. Set the microammeter to the 2 millampere range. Set the decade resistor box to 100 kilohms. Set the Stress Leakage Current to 1 mA. Repeat the Performance Test from step 8. This concludes the Leakage Current Accuracy Verification.

NOTE: If the instrument performance does not meet the stated specifications, repair is needed. None of the available calibrations will correct this condition.

5.1.2 DUT Test Signal Verification

This test provides a general verification of proper operation of the Flash test. The DUT voltage is monitored on an oscilloscope while a test (using specified test conditions) is performed. The oscilloscope trace is compared to the expected trace to verify that the test is being performed properly.

5.1.2.1 Equipment Required

The following equipment is required for this performance test:

Known-good capacitor, 100 nanofarad (0.1 microfarad), 1%, film, 250 volt (or greater)
Oscilloscope, 10 millivolt sensitivity, 20 megahertz bandwidth, 1% time base accuracy, 1 megohm impedance, triggered sweep
Oscilloscope probe, x10, 10 megohm impedance

5.1.2.2 Procedure

STEP 1. Press the POWER pushbutton to turn the 5300 to 1 (on). Allow the instrument to warm up for at least 10 minutes.

STEP 2. Connect the oscilloscope probe to the High Voltage probe in the test head. Connect the ground lead of the oscilloscope probe to the shield of the High Voltage cable that connects to the High Voltage probe. If this shield is not accessible, the ground connection on the rear panel of the 5300 can be used.

STEP 3. Adjust the oscilloscope for a horizontal sweep of 10 milliseconds/division and a vertical scale (including probe) of 50 volts/division. Turn the oscilloscope power on.

STEP 4. Connect the capacitor to the test head probes in the normal manner.

STEP 5. Close the test head cover. Observe that the INTERLOCK LED on the 5300 turns off.

STEP 6. Set the test conditions as shown in Table 5-2. For information on setting these conditions, refer to Set Mode, Section 3.4.4.

Table 5-2. Signal Verification Test Conditions

Stress Voltage	250 V
Stress Leakage Current	25 uA
Stress Soak Time	10 ms
Check Voltage	50 V
Check Leakage Current	25 uA
Check Soak Time	20 ms
Nominal Value	100 nF
Charge Rate	2.5 mA

NOTE: If the instrument does not meet the specifications in the following test, a full calibration should be performed and this test should be repeated. Refer to CALIBRATION, Section 5.2. If the specifications are exceeded after the calibration is performed, repair is needed.

STEP 7. Initiate a test and observe the waveform on the oscilloscope. The waveform should appear as shown in Figure 5-2. All of the dimensions labeled in the waveform should be within the ranges specified in Table 5-3. For information about initiating a test, refer to TEST CABLE ASSEMBLY, Section 7.4, (Handler Interface) Control Inputs, Section 3.6.2.2, or COMMUNICATION INTERFACES, Section 3.7.

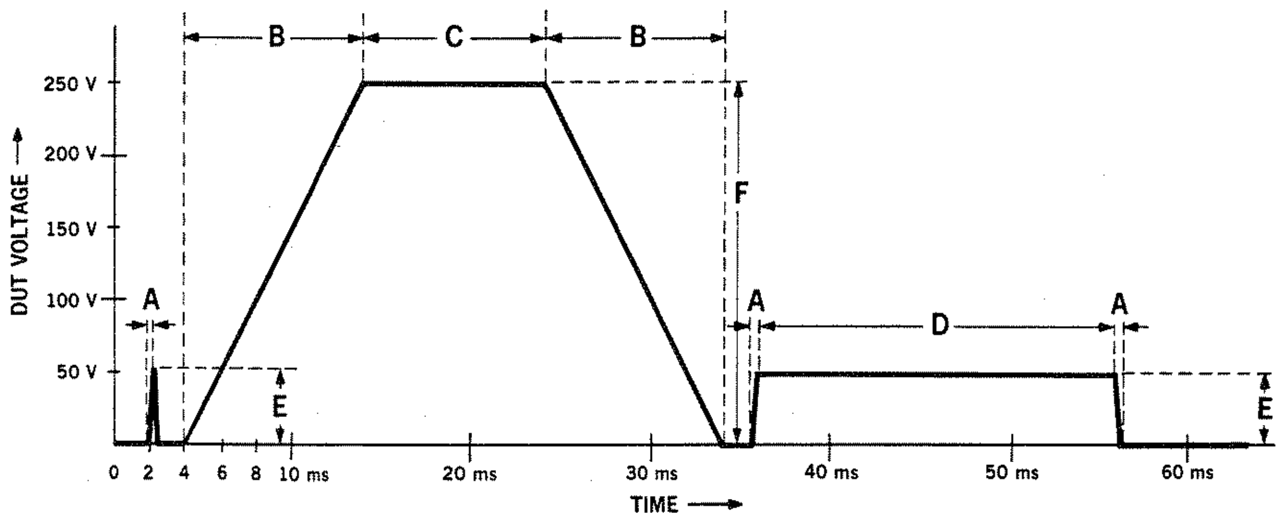


Figure 5-2. Test Waveform with 2.5 mA Charge Rate

Table 5-3. 2.5 mA Charge Rate Waveform Measurements

Label	Nominal	Minimum	Maximum
A	100 ns	90 ns	110 ns
B	10 ms	9 ms	11 ms
C	10 ms	10 ms	15 ms
D	20 ms	20 ms	25 ms
E	50 V	47.5 V	52.5 V
F	250 V	237.5 V	262.5 V

STEP 8. Change the Charge Rate to 50 mA.

STEP 9. Initiate a test and observe the waveform on the oscilloscope. The waveform should appear as shown in Figure 5-3. All of the dimensions labeled in the waveform should be within the ranges specified in Table 5-4.

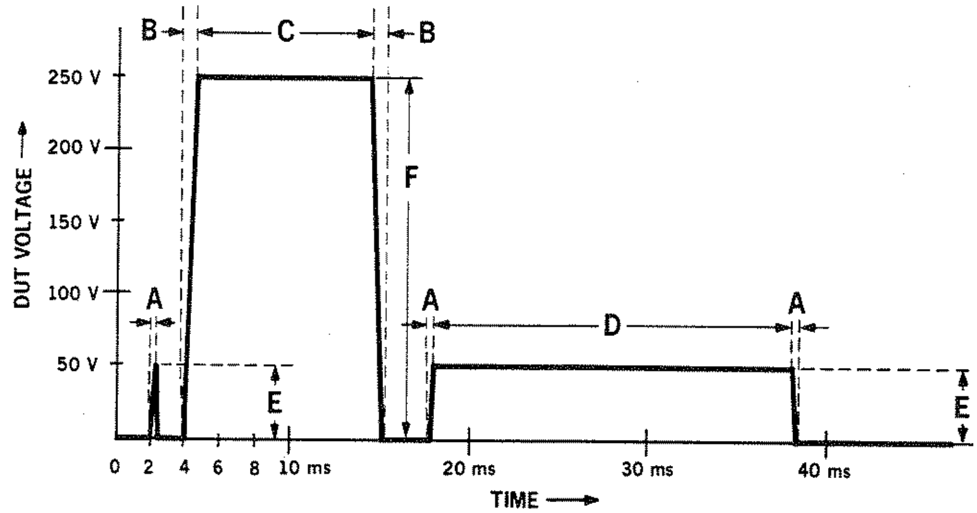


Figure 5-3. Test Waveform with 50 mA Charge Rate

Table 5-4. 50 mA Charge Rate Waveform Measurements

Label	Nominal	Minimum	Maximum
A	100 ns	90 ns	110 ns
B	500 ns	450 ns	550 ns
C	10 ms	10 ms	15 ms
D	20 ms	20 ms	25 ms
E	50 V	47.5 V	52.5 V
F	250 V	237.5 V	262.5 V

STEP 10. If it is desired to check the waveform at any other Charge Rates, a similar procedure should be followed. The desired Charge Rate should be programmed and a test performed. The waveform should not change, except for the slope and the duration of the Stress charge and discharge cycles. Table 5-5 lists the proper duration for either (charge or discharge) cycle at different charge rates, labeled "B" in Figures 5-2 and 5-3.

Table 5-5. Charge or Discharge Duration

RATE (mA)	Duration (milliseconds)		
	Nominal	Minimum	Maximum
2.5	10.00	9.00	11.00
5	5.00	4.50	5.50
10	2.50	2.25	2.75
15	1.67	1.50	1.83
20	1.25	1.13	1.38
25	1.00	0.90	1.10
30	0.83	0.75	0.92
35	0.71	0.64	0.79
40	0.63	0.56	0.69
45	0.56	0.50	0.61
50	0.50	0.45	0.55

5.2 CALIBRATION

The 5300 has been designed to allow complete calibration without opening the instrument. The adjustments are performed entirely through the use of the SELECT and SET pushbuttons located on the front panel.

There are four calibrations that are available: HV Clamp, Stress Test Stray, Check Test Stray, and Presence. The HV Clamp calibration provides a minor adjustment to improve the accuracy of the Stress test voltage. This calibration should be performed after instrument repair and as part of installation.

The Stress Test Stray calibration and the Check Test Stray calibration allow the instrument to account for the charge and discharge current that flows into and out of the stray capacitances instead of the DUT. The stray capacitances are found both inside the instrument and in the Test cable assembly. These calibrations should be performed as part of installation and after instrument repair. If the total capacitance (from conductors to shield) of the Test cable assembly and test fixture changes by 20% or more, this calibration should be performed. Typically, a calibration will be necessary after a change of Test cable, but not after a change of test fixture.

The Presence calibration allows the instrument to account for the probe-to-probe capacitance when performing a Part Present test. This calibration should be performed after every change in Check Voltage, change of test fixture, after instrument repair, and as part of installation.

Table 5-6 summarizes when each calibration should be performed.

> **NOTE:** All of the following calibrations must be performed with an ambient temperature in the range of 20 to 30°C (68 to 86°F) and with the line voltage within the specified range appropriate for the line voltage setting.

NOTE: Calibration values are stored on the CPU Circuit Assembly. A full recalibration **must** be performed if this circuit assembly is replaced.

Table 5-6. Calibration Intervals

Calibration	When Performed
HV Clamp	Installation After repair Every 6 months
Stress and Check Stray	Installation After repair After changing Test cable or test fixture (see text) Every 6 months
Presence	After Check Voltage change After test fixture change Installation After repair Every 6 months

5.2.1 HV Clamp Calibration

The HV Clamp calibration provides a method for making minor adjustments to the Stress Voltage. This calibration should need to be done only when a repair has been made to the instrument.

5.2.1.1 Equipment Required

Known-good capacitor, 470 picofarad or less, 1%, COG or other non-voltage-dependent type ceramic or film, 250 volt or greater

3-1/2 digit voltmeter, 0.1% accuracy

5.2.1.2 Procedure

STEP 1. Press the POWER pushbutton to turn the 5300 to 1 (on). Allow the instrument to warm up for at least 10 minutes.

STEP 2. Set the test conditions as indicated in Table 5-7. For information on setting these conditions, refer to Set Mode, Section 3.4.4.

Table 5-7. HV Clamp Calibration Test Conditions

Stress Voltage	250 V
Stress Leakage Current	100 uA
Stress Soak Time	5.0 s
Check Voltage	0 V
Check Leakage Current	100 uA
Check Soak Time	0 ms
Nominal Value	Value of capacitor
Charge Rate	50 mA

STEP 3. Connect the voltmeter to the V test point accessed through the rear panel of the 5300. Connect the ground lead of the voltmeter to the ground test point also on the rear panel. Refer to Figure 5-4.

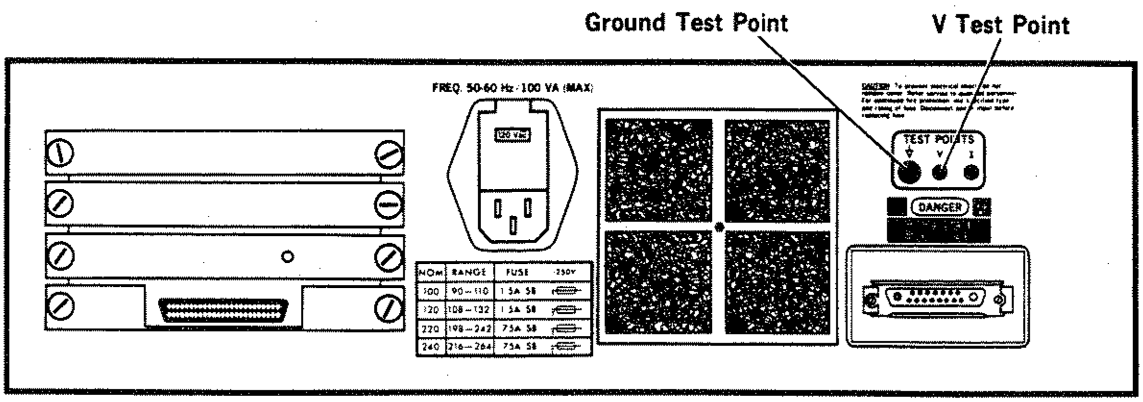


Figure 5-4. Test Point Locations

STEP 4. Set the voltmeter to allow it to read 2.50 volts with a resolution of 10 millivolts.

STEP 5. Place the capacitor in the test fixture and close the test fixture or test head cover. The INTERLOCK LED on the 5300 should turn off. Refer to Figure 5-5 for the location of this LED.

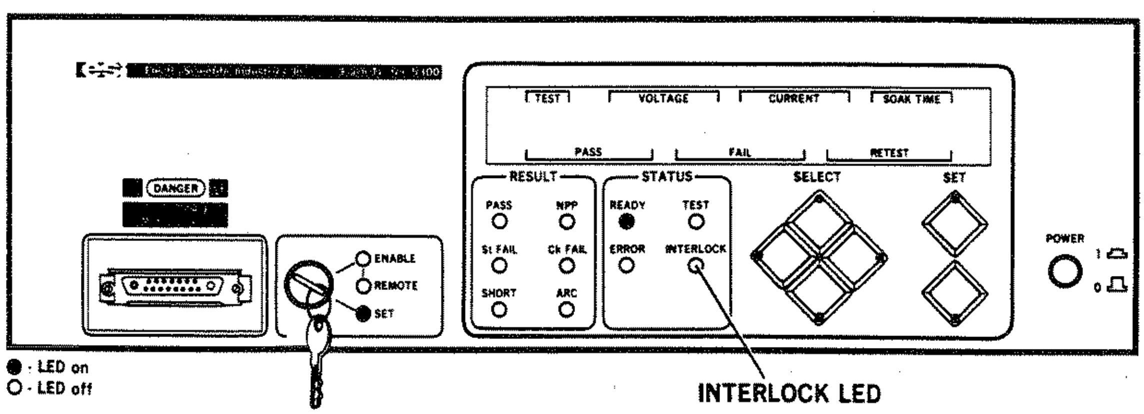


Figure 5-5. INTERLOCK LED Location

STEP 6. Display the HV Clamp Calibration screen by entering the Configure mode and pressing the UP or DOWN pushbutton as many times as is necessary. For information on entering the Configure mode, refer to Entering the Configure Mode, Section 3.4.5.1. Figure 5-6 is an example of the HV Clamp Calibration screen.

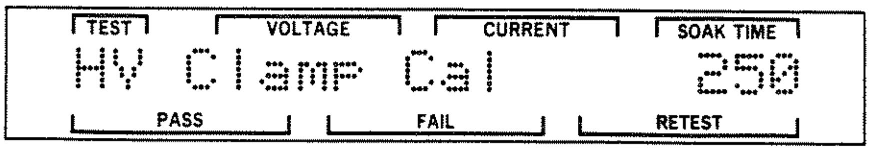


Figure 5-6. HV Clamp Calibration Screen

STEP 7. Turn the access keyswitch to the ENABLE position to allow a test to be initiated. Initiate a test. The instrument will perform a normal Flash test. For information about initiating a test, refer to TEST CABLE ASSEMBLY, Section 7.4, (Handler Interface) Control Inputs, Section 3.6.2.2, or COMMUNICATION INTERFACES, Section 3.7.

STEP 8. Observe the reading on the voltmeter. It is measuring the DUT voltage divided by 100. The correct reading is 2.50 volts. If the reading is between 2.49 and 2.51 volts, the calibration is complete and the next step should be skipped.

STEP 9. Turn the access keyswitch to the SET position and press the INC and DEC pushbuttons to return to the HV Clamp Calibration screen. If the voltmeter reading was greater than 2.51 volts, press the DEC pushbutton once and return to step 7. If the voltmeter reading was less than 2.49 volts, press the INC pushbutton once and return to step 7.

5.2.2 Stress and Check Stray Calibrations

The Stray calibrations permit the 5300 to account for current that flows into stray capacitance instead of into the DUT. This stray capacitance is found within the 5300, in the Test cable assembly, and in the test fixture. The probe-to-shield capacitance of the test fixture is usually insignificant with respect to the rest of the stray capacitance, so a change of test fixture should not require a new set of Stray calibrations.

5.2.2.1 Equipment Required

Known-good capacitor, 240 picofarad to 270 picofarad, 1%, COG or other non-voltage-dependent ceramic or film, 500 V or greater

Oscilloscope, 1 mV sensitivity, 20 MHz bandwidth, 1% timebase accuracy, 1 megohm impedance, triggered sweep

Oscilloscope probe, x10, 10 megohm impedance

5.2.2.2 Procedure

STEP 1. Press the POWER pushbutton to turn the 5300 to 1 (on). Allow the instrument to warm up for at least 10 minutes.

STEP 2. Set the test conditions as indicated in Table 5-8. For information on setting these conditions, refer to Set Mode, Section 3.4.4.

Table 5-8. Stress Stray Calibration Test Conditions

Stress Voltage	450 V
Stress Leakage Current	100 uA
Stress Soak Time	0 ms
Check Voltage	0 V
Check Leakage Current	100 uA
Check Soak Time	0 ms
Nominal Value	Value of capacitor
Charge Rate	50 mA

STEP 3. Connect the oscilloscope probe to the I test point accessed through the rear panel of the 5300. Connect the ground lead of the probe to the ground test point also on the rear panel. Refer to Figure 5-7.

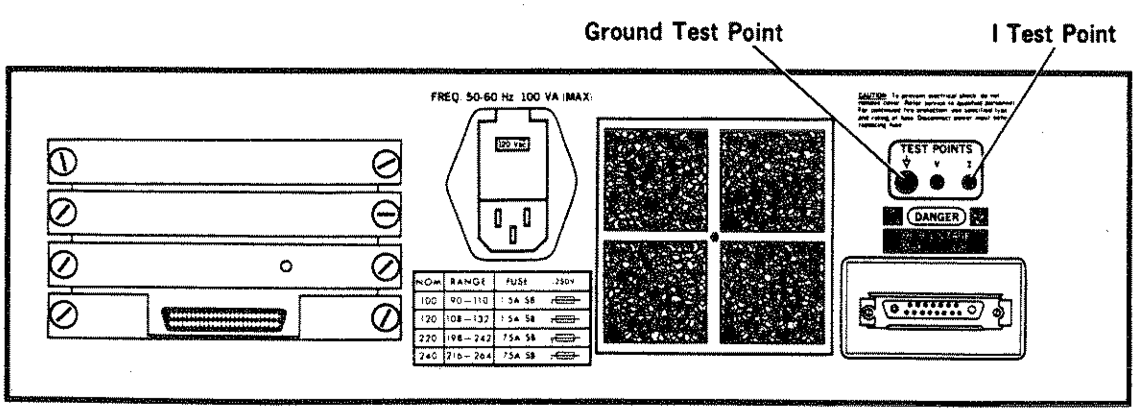


Figure 5-7. Test Point Locations

STEP 4. Adjust the oscilloscope for a horizontal sweep of 0.2 microsecond/division and a vertical scale (including probe) of 100 millivolts/division.

STEP 5. Place the sample capacitor in the test fixture and close the test fixture or test head cover. The INTERLOCK LED on the 5300 should turn off. Refer to Figure 5-8 for the location of this LED.

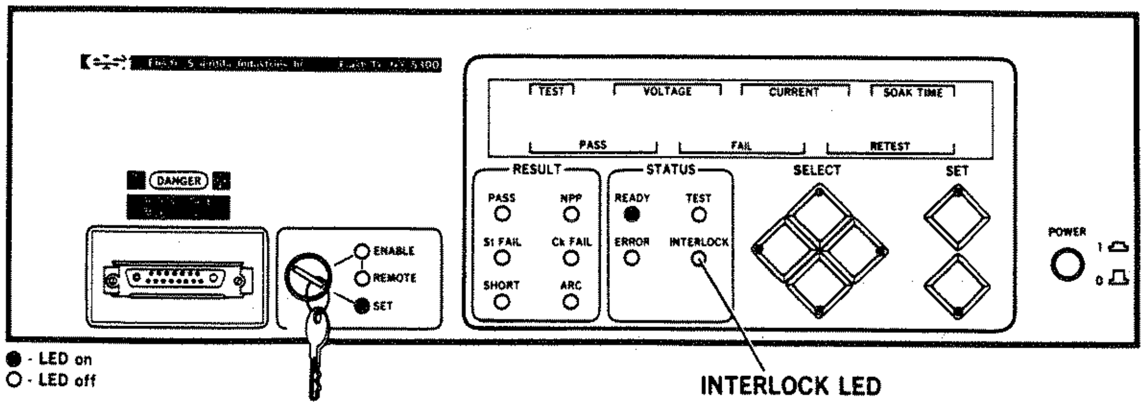


Figure 5-8. INTERLOCK LED Location

STEP 6. Display the Stress Test Stray Calibration screen by entering the Configure mode and pressing the UP or DOWN pushbutton as many times as is necessary. For information on entering the Configure mode, refer to Entering the Configure Mode, Section 3.4.5.1. Figure 5-9 is an example of the Stress Test Stray Calibration screen.

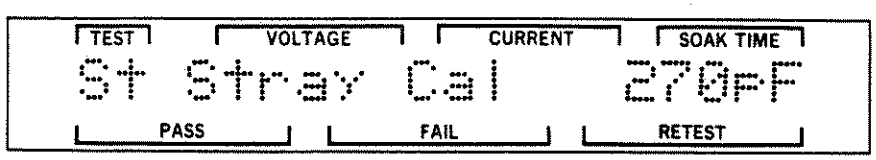


Figure 5-9. Stress Test Stray Calibration Screen

STEP 7. Press the RIGHT pushbutton to initiate testing. The instrument will repeat standard Flash tests until the LEFT, UP, or DOWN pushbutton is pressed or the access keyswitch is turned to the ENABLE position.

STEP 8. Observe the waveform on the oscilloscope. There should be one pulse displayed, as shown in Figure 5-10. The voltage being measured is produced by the DUT current passing through a 10 ohm resistor.

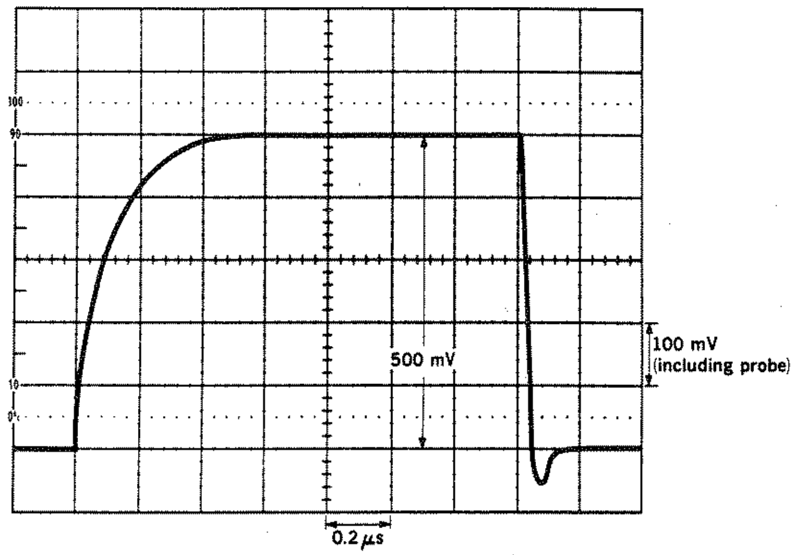


Figure 5-10. Stress Stray Calibration Oscilloscope Trace

STEP 9. The height of the pulse displayed on the oscilloscope should be 500 millivolts (including probe attenuation), representing a DUT current of 50 milliamperes. Press the INC or DEC pushbutton to increase or decrease the pulse height to the correct value.

STEP 10. Press the LEFT pushbutton to terminate testing.

STEP 11. Set the Check Voltage to 50 volts. Press the UP pushbutton until the Check Test Conditions screen is displayed. Figure 5-11 is an illustration of this screen.

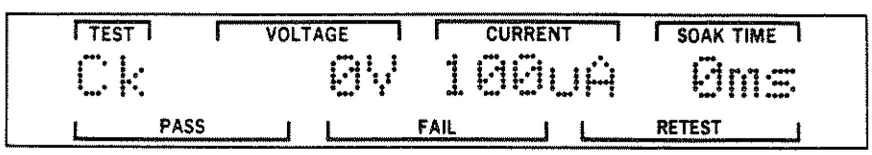


Figure 5-11. Check Test Conditions Screen

STEP 12. Press the RIGHT pushbutton to allow the Check Voltage to be changed. It should be the only value displayed.

STEP 13. Press the INC pushbutton twice to set the Check Voltage to 50 volts.

STEP 14. Press the LEFT pushbutton once to return to the Check Test Conditions screen.

STEP 15. Press the DOWN pushbutton once to display the Nominal Capacitance and Charge Rate screen. Figure 5-12 is an illustration of this screen.

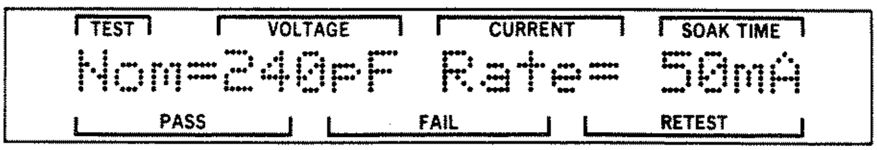


Figure 5-12. Nominal Capacitance and Charge Rate Screen

STEP 16. Press the INC and DEC pushbuttons simultaneously to enter the Configure mode. Press the DOWN pushbutton until the Check Test Stray Calibration screen is displayed. Figure 5-13 is an example of this screen.

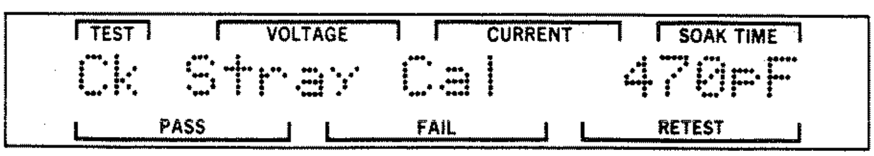


Figure 5-13. Check Test Stray Calibration Screen

STEP 17. Adjust the oscilloscope for a horizontal sweep of 50 nanoseconds/division.

STEP 18. Press the RIGHT pushbutton to initiate testing. The instrument will repeat standard Flash tests until the LEFT pushbutton is pressed or the access keyswitch is turned to the ENABLE position.

STEP 19. Observe the waveform on the oscilloscope. There should be two pulses displayed, one for the Stress current and one for the Check current, as shown in Figure 5-14. The Stress current pulse should be about nine times as wide as the Check current pulse (because of the different voltages).

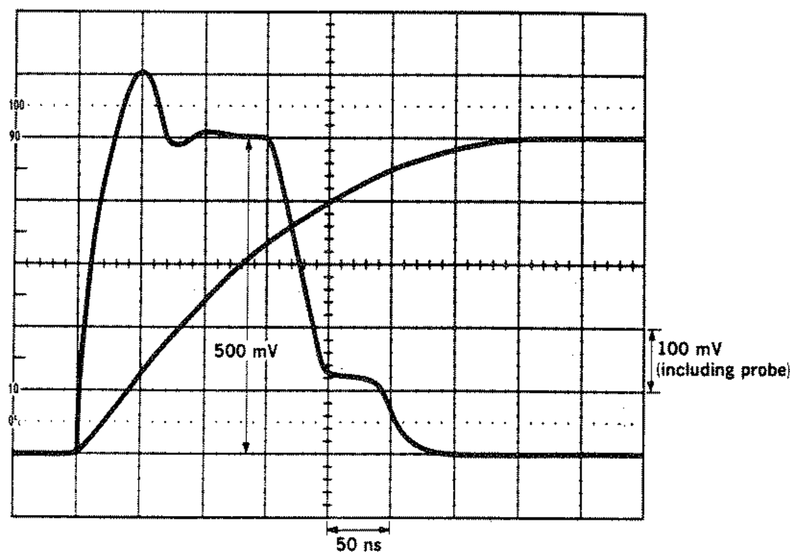


Figure 5-14. Check Stray Calibration Oscilloscope Trace

STEP 20. The height of the Check current pulse displayed on the oscilloscope should be 500 millivolts (including probe attenuation), representing a DUT current of 50 milliamperes. Press the INC or DEC pushbutton to increase or decrease the pulse height to the correct value.

STEP 21. Press the LEFT pushbutton to terminate testing. The calibration is complete.

5.2.3 Presence Calibration

The Presence calibration allows the 5300 to account for probe-to-probe capacitance when performing a valid Part Present test. This calibration should be performed whenever a test fixture is changed or the Check test voltage is changed.

The Presence calibration consists of conducting a series of Part Present tests at different calibration values, determining the threshold where the probe-to-probe capacitance is no longer detected as a DUT, and setting a somewhat higher calibration value. As the Part Present test is performed at the Check voltage, it is essential that this voltage is set before the Presence calibration is performed.

Increasing the calibration value above the threshold value assures that a slight increase of probe-to-probe capacitance (or noise induced into the 5300) will not cause false Part Present readings. This increase represents the amount of DUT capacitance that must be exceeded for the 5300 to detect its presence.

The calibration value at the threshold is a rough measure of the probe-to-probe capacitance. At a Check voltage of 50 volts, each count of this calibration value represents about 0.04 picofarad. At 25 volts, each count is about 0.08 picofarad. For a small DUT (a few picofarads), the calibration value should be increased about 12 counts at 50 volts or about 6 counts for 25 volts. For larger DUT values, the calibration value increase can be proportionally larger. If the increase is too small, external noise will affect the Part Present test. If the increase is too large, very small DUTs may not be detected.

5.2.3.1 Equipment Required

This calibration requires the test fixture that will be used to test components and a sample capacitor that is the minimum value (and of the same type) that will be used in the test fixture during normal testing.

5.2.3.2 Procedure

STEP 1. Press the POWER pushbutton to turn the 5300 to 1 (on). Allow the instrument at least 10 minutes warm-up time before performing the remainder of this procedure.

STEP 2. Enter the SET mode by turning the access keyswitch to the SET position. The SET LED next to the access keyswitch should illuminate. If the REMOTE LED is illuminated, a remote device has control of the system. The remote device must give up control before this calibration can proceed. Refer to PROGRAMMING, Section 3.9.

STEP 3. Before the Check Voltage or the Nominal Capacitance can be changed, the Bin Count totals must be set to 0. Press the DOWN pushbutton until the Bin Count Totals screen is displayed. Refer to Figure 5-15.

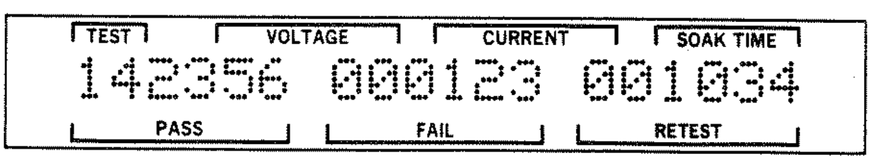


Figure 5-15. Bin Count Totals Screen

STEP 4. Press the RIGHT pushbutton to enter the Detail screens. Press the UP or DOWN pushbutton until the Reset Bin Count Totals screen is displayed. Refer to Figure 5-16.

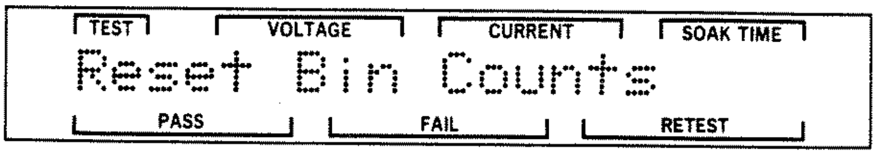


Figure 5-16. Reset Bin Count Totals Screen

STEP 5. Reset the totals to 0 by pressing the RIGHT pushbutton. Return to the Bin Count Totals screen by pressing the LEFT pushbutton.

STEP 6. Set the Check voltage (0, 25, or 50 VDC) that will be used in normal testing. Press the UP or DOWN pushbuttons until Ck is seen at the left of the display. Press the RIGHT pushbutton once to display only the Check voltage. Press the INC or DEC pushbutton to set the desired voltage. Refer to Figure 5-17 for an example of this screen.

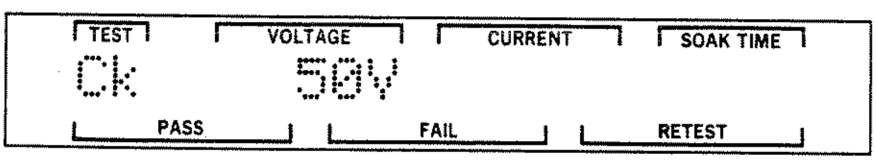


Figure 5-17. Check Voltage Screen

STEP 7. Press the LEFT pushbutton, then the DOWN pushbutton to display the Nominal Capacitance and Charge Rate screen. Press the RIGHT or LEFT pushbutton until only the Nominal Capacitance is displayed. Press the INC or DEC pushbutton to set this to the nominal value of the sample capacitor. Refer to Figure 5-18 for an example of this screen.

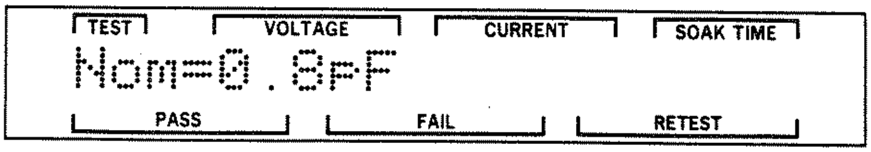


Figure 5-18. Nominal Capacitance Screen

STEP 8. Press the LEFT pushbutton, then the DOWN pushbutton to display the Presence Calibration screen. Refer to Figure 5-19 for an example of this screen.

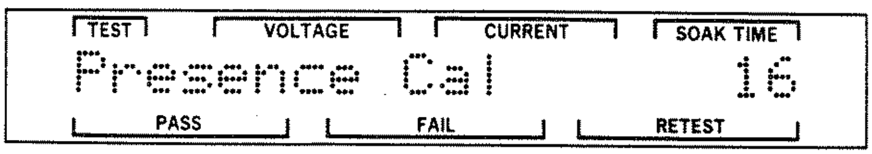


Figure 5-20. Presence Calibration Screen

STEP 9. Install the test fixture (that holds and probes the DUT) exactly as it will be used in normal testing.

STEP 10. Verify that there are no DUTs in the test fixture. Set the test fixture probes to normal spacing, **without** allowing them to contact each other.

STEP 11. Close the test head or test fixture cover. Verify that the INTERLOCK LED on the 5300 is no longer illuminated. Refer to Figure 5-20 for the location of this LED.

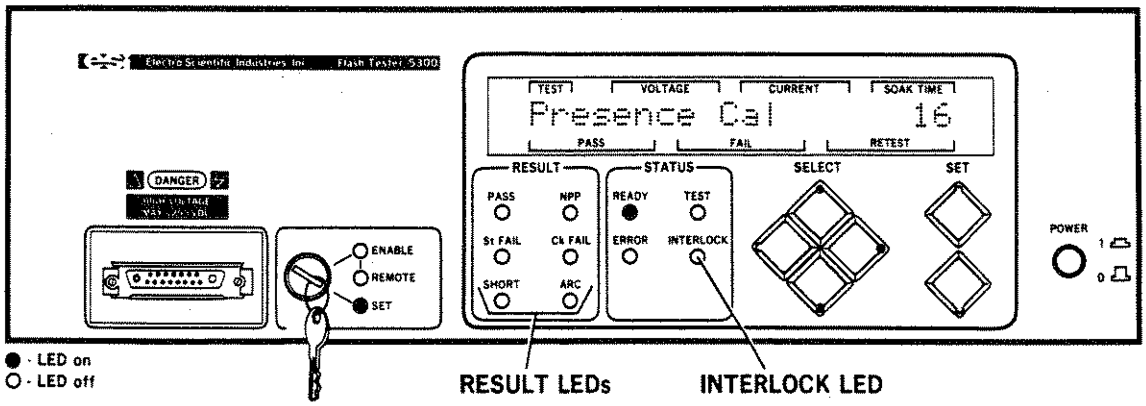


Figure 5-20. LED Locations

STEP 12. Enable the Presence calibration by pressing the RIGHT pushbutton. Initiate the Presence calibration by pressing either the INC or DEC pushbutton. A Part Present test will be performed, with the result appearing on the RESULT LEDs.

STEP 13. If the NPP (No Part Present) LED is illuminated, press the DEC pushbutton to decrease the Presence calibration value (and initiate another Part Present test). If the PASS LED is illuminated, press the INC pushbutton to increase the Presence calibration value (and initiate another Part Present test).

STEP 14. Repeat the preceding step until the test result changes from NPP to PASS or from PASS to NPP or until a calibration value of 12 is reached and NPP is still illuminated.

STEP 15. If a calibration value of 12 was reached and NPP remained illuminated, proceed to the following step.
The Presence calibration value that is now displayed is the threshold at which the probe-to-probe capacitance is no longer detected as a DUT. That is, if a higher calibration value is set, very small DUTs may not be detected as being present; if a lower calibration value is set, the probe-to-probe capacitance will be detected as a DUT. The Presence calibration value should be increased (by pressing the INC pushbutton) by 12 counts for a 50 volt Check voltage or by 6 counts for a 25 volt Check voltage. This will provide a small "guard band" to allow reliable detection of DUT presence.

STEP 16. Place the sample capacitor in the test fixture. Close the test head or test fixture cover. Verify that the INTERLOCK LED on the 5300 is no longer illuminated.

STEP 17. Press the INC pushbutton to perform another Part Present test. Press the DEC pushbutton to perform another Part Present test. In both cases, the PASS LED should illuminate to indicate that the presence of the part was detected. If the NPP LED is illuminated, either there is poor contact to the DUT, the DUT is open, or the calibration value is too high.

STEP 18. Repeat the preceding step several times to verify that the 5300 can reliably detect the presence of the DUT.

STEP 19. Press the LEFT pushbutton followed by the UP or DOWN pushbutton to leave the Presence Calibration screen. This calibration is complete.

5.3 MAINTENANCE

The 5300 was designed to keep maintenance to a minimum. Normal maintenance consists of keeping the instrument free of dust and dirt and cleaning of the fan filter. The following sections describe these two tasks.

5.3.1 Cleaning the Exterior

WARNING

BEFORE CLEANING THE EXTERIOR OF THE INSTRUMENT, UNPLUG THE POWER CORD FROM THE INSTRUMENT. FAILURE TO DO SO CAN CAUSE SERIOUS INJURY IF CLEANING SOLVENT IS ALLOWED TO ENTER THE INSTRUMENT.

The 5300 shoud be kept clean of dust and dirt. The vents should be checked often to ensure that the flow of air through the instrument is not obstructed.

Loose dust on the exterior may be removed with a soft cloth or a dry brush. Water and mild detergent may be used; however, abrasive cleaners should **not** be used.

CAUTION

AVOID THE USE OF CHEMICAL CLEANING AGENTS WHICH MIGHT DAMAGE THE PLACTICS USED IN THIS INSTRUMENT. DO NOT APPLY ANY SOLVENT CONTAINING KETONES, ESTERS, OR HALOGENATED HYDROCARBONS. TO CLEAN, USE ONLY WATER SOLUBLE DETERGENTS, ETHYL, METHYL, OR ISOPROPYL ALCOHOL.

5.3.2 Cleaning the Fan Filter

The fan filter should be inspected on a frequent basis to prevent it from being clogged. The cleanliness of the work environment and the amount of use will determine how often this is required. The filter should be inspected at least every 3 months.

Cleaning of the filter is performed as follows.

STEP 1. Turn instrument power to 0 (off) and remove the power cord.

STEP 2. Remove the fan filter guard by unscrewing the screw that secures it. Refer to Figure 5-21.

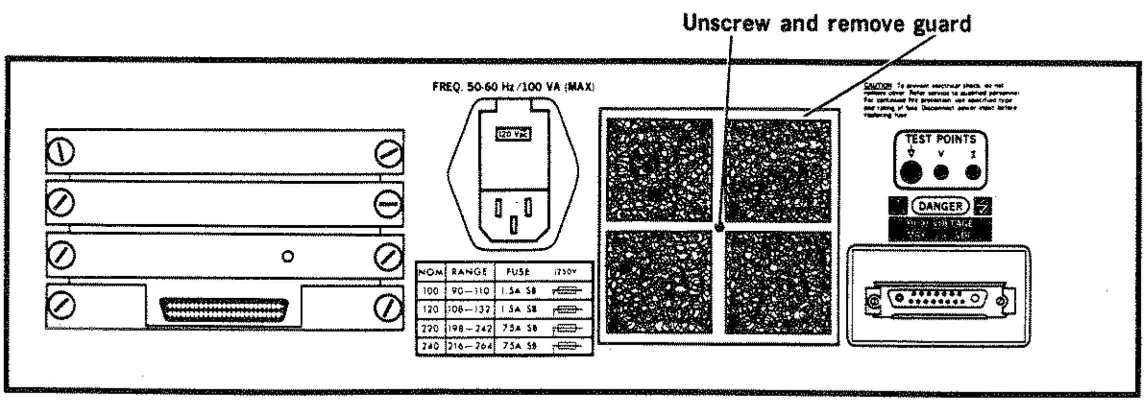


Figure 5-21. Removing the Fan Filter Guard

STEP 3. Remove the fan filter. Clean the filter by shaking it or by blowing air across it.

STEP 4. Replace the filter on the instrument.

STEP 5. Replace the fan filter guard. Secure it using the screw that was removed earlier.

STEP 6. Replace the power cord.

SECTION 6
DIAGNOSTIC MESSAGES

Certain system errors will produce a corresponding diagnostic message on the 20-character display. These messages are listed in this section, with a description and suggested course of action for each.

Zero Volts Failure

This message indicates that the discharge circuitry is unable to return the DUT to zero volts after a test. Press the POWER pushbutton once to the instrument to 0 (off), then press it again to turn the instrument to 1 (on). If the message reappears, the instrument requires repair of the failed circuitry. Discharge the DUT according to appropriate methods. Handle the DUT carefully as it may not be fully discharged.

DANGER

IF THE ZERO VOLTS FAILURE MESSAGE IS DISPLAYED, THE DUT MAY BE CHARGED TO A LETHAL VOLTAGE. EXTREME CARE MUST BE TAKEN TO DISCHARGE THE DUT SAFELY. CONTACT WITH THE DUT LEADS COULD CAUSE SEVERE INJURY AND/OR DEATH.

High Temperature

This message indicates that the internal temperature of the instrument has exceeded operating limits. The POWER pushbutton should be pressed to turn the instrument to 0 (off). The fan filter should be checked as a plugged filter can cause internal temperatures to rise quickly. Refer to Cleaning the Fan Filter, Section 5.3.2. Once the instrument has had adequate time to cool off and the filter has been checked or cleaned, the instrument can be used again.

HV Clamp Error

This message indicates that the High Voltage Clamp circuitry is not functioning properly. Press the POWER pushbutton once to the instrument to 0 (off), then press it again to turn the instrument to 1 (on). If the message reappears, the instrument requires repair of the failed circuitry.

Low Battery in ZRAM

This message indicates that the battery backup for the RAM on the CPU circuit assembly requires replacement. Contact ESI (503-641-4141) for information about replacing the battery.

Faulty CPU

This message indicates that the CPU failed the power-up self test. The POWER pushbutton should be pressed to turn the instrument to 0 (off). Contact ESI (503-641-4141) for information about replacing the CPU.

ROM Failure

This message indicates that the ROM (on the CPU circuit assembly) has failed the power-up self test. The POWER pushbutton should be pressed to turn the instrument to 0 (off). Contact ESI (503-641-4141) for information about replacing the ROM.

SECTION 7
INSTALLATION

This section is intended to provide information for unpacking the 5300, verifying that it is functioning, connecting it to the rest of the system, and performing a full system checkout.

7.1 UNPACKING

When the 5300 is received, it should be carefully removed from its shipping box and checked for proper operation. This is done as follows.

STEP 1. Open the shipping box and remove the packing slip. Be careful to not damage the 5300 while opening the shipping box.

STEP 2. Remove the 5300 and all accessories from the shipping box. Check the packing slip to verify that all parts are found. If any parts are missing, contact ESI immediately.

STEP 3. Inspect the 5300 for shipping damage. If any is found, contact the shipper immediately. Keep the shipping box and any packing material for the shipping damage claim and for any future shipping of the 5300.

7.2 LINE POWER CONNECTION

Before the Preliminary Checkout can be performed, the 5300 must be connected to a source of line power. This involves selecting the appropriate voltage on the power entry module, installing the proper fuse in the power entry module, and connecting the appropriate power cord. The following sections describe these procedures.

7.2.1 Line Voltage and Fuse Selection

Selection of the appropriate line voltage and fuse consists of opening the cover to the power entry module, removing the voltage selector, replacing the voltage selector with the appropriate voltage displayed, installing the appropriate fuse, and closing the cover. This is accomplished as follows.

STEP 1. Locate the power entry module that is found on the rear panel of the instrument. Remove the power cord from the connector on this module. Refer to Figure 7-1.

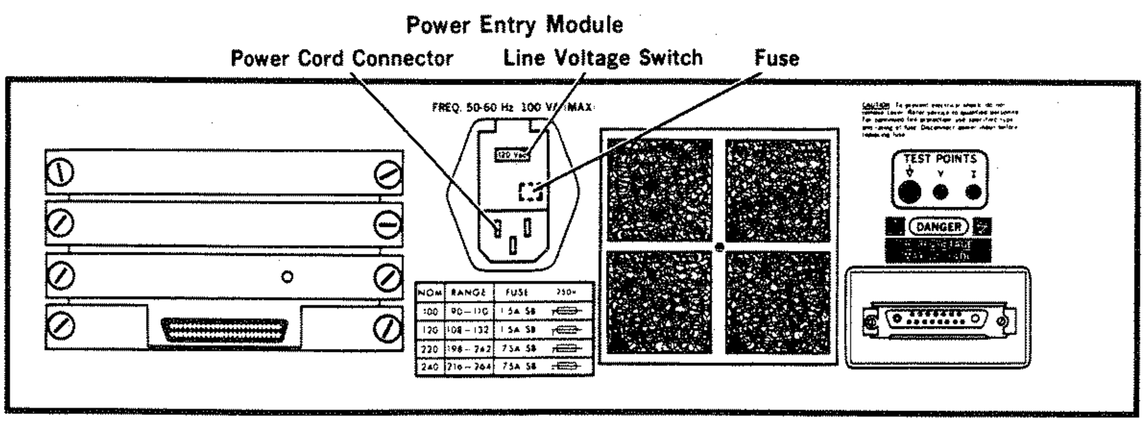


Figure 7-1. Location of Power Entry Module

STEP 2. Pry open the cover with a flat-bladed screwdriver, using the notch provided. Refer to Figures 7-2a and 7-2b.

STEP 3. Remove the voltage selector, rotate it so the appropriate voltage is visible, and replace it in the power entry module. Refer to Figure 7-2c.

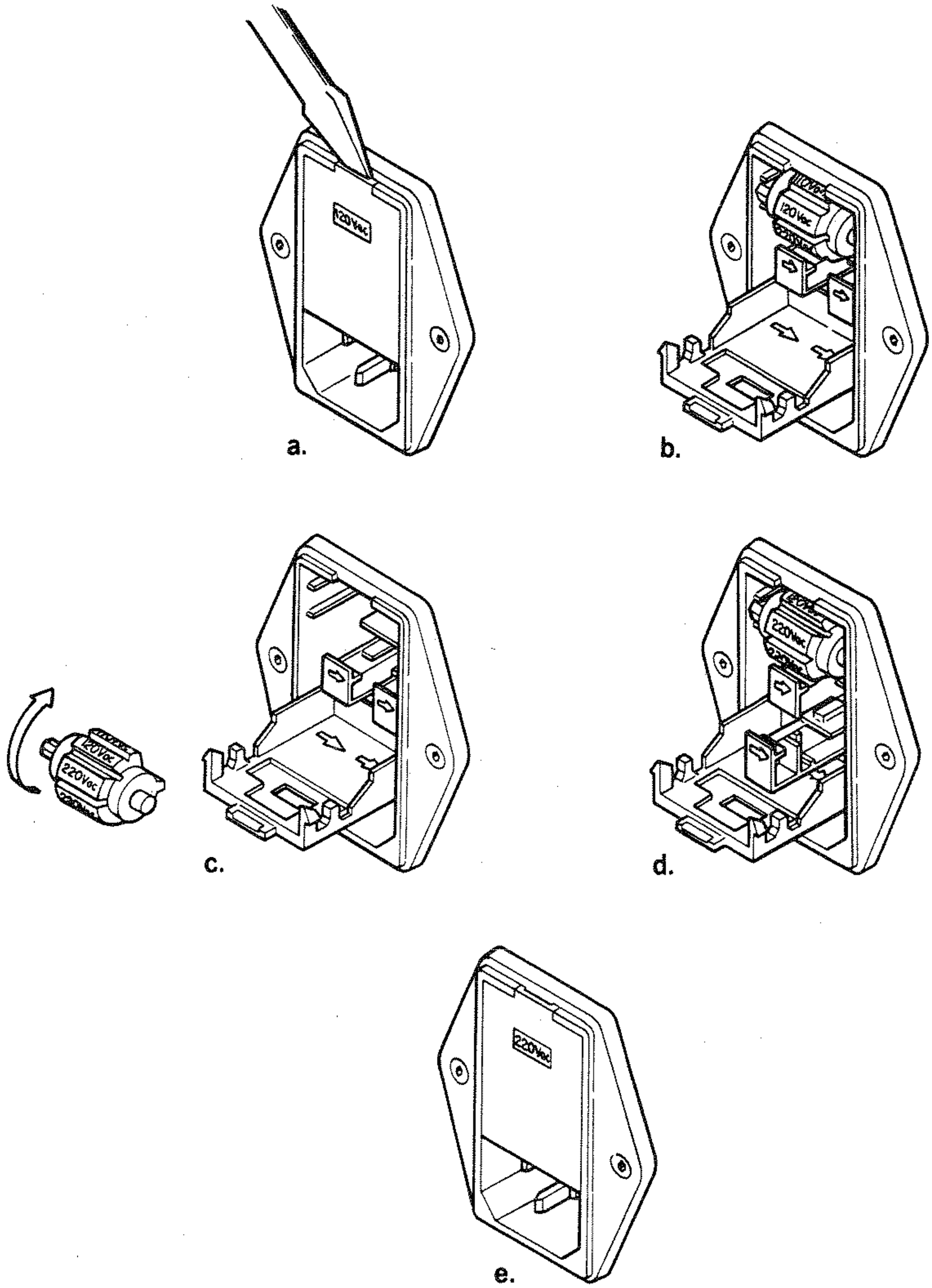


Figure 7-2. Selecting the Appropriate Voltage

STEP 4. Remove both fuse holders, as indicated in Figure 7-2d. One fuse holder is used with metric (5 x 20) fuses, the other is used for American (3AG) fuses. Install the appropriate fuse in the appropriate fuse holder (1.5 A Slow Blow for 100 and 120 VAC, 0.75 A Slow Blow for 220 and 240 VAC).

STEP 5. Replace the fuse holder with the fuse in the right-hand position. Replace the unused fuse holder in the left-hand position. Close the cover, as indicated in Figure 7-2e.

7.2.2 Selecting and Connecting the Power Cord

If the power cord supplied with the instrument is not correct for your area, an appropriate one must be selected. Figure 7-3 indicates the type of connector and wiring that is typical for different areas of the world. It is the installer's responsibility to verify that the connector on the power cord is correctly installed for the area.

STEP 1. Verify that the power cord is correct for the area in which the instrument will be used. If the power cord supplied with the instrument is not correct, a proper one must be obtained. Refer to Figure 7-3 for assistance in identifying the appropriate connector for the power cord.

STEP 2. Plug one end of the power cord into the power cord connector on the power entry module on the rear panel of the instrument.

STEP 3. Plug the other end of the power cord into a source of line power.

NOTE: To maximize noise immunity, the 5300 should be plugged into the same outlet as the handler and test head (if present). It is important that the neutral lines be the same for all of the equipment.

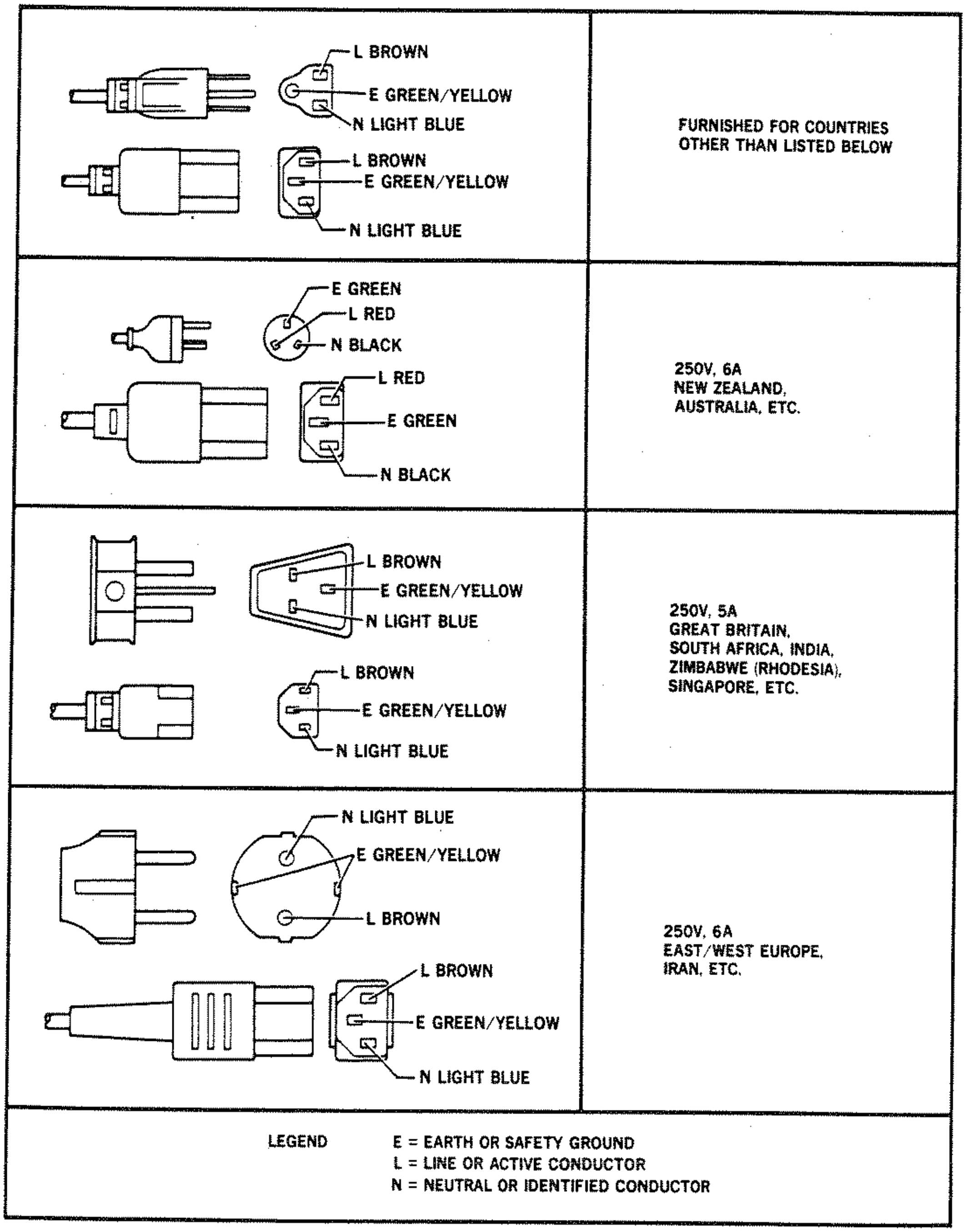


Figure 7-3. Power Cord Connectors

7.3 PRELIMINARY CHECKOUT

The Preliminary Checkout provides a very basic test of proper instrument operation. It is useful to verify that the instrument has not experienced severe damage in shipment. It is performed as follows.

STEP 1. Verify that the line voltage switch, fuse, and power cord have been installed correctly, as described in the previous section.

STEP 2. Verify that there are no external connections made to the test connector that is located on either the front or rear of the instrument. Refer to Figure 7-4 for the two locations of this connector.

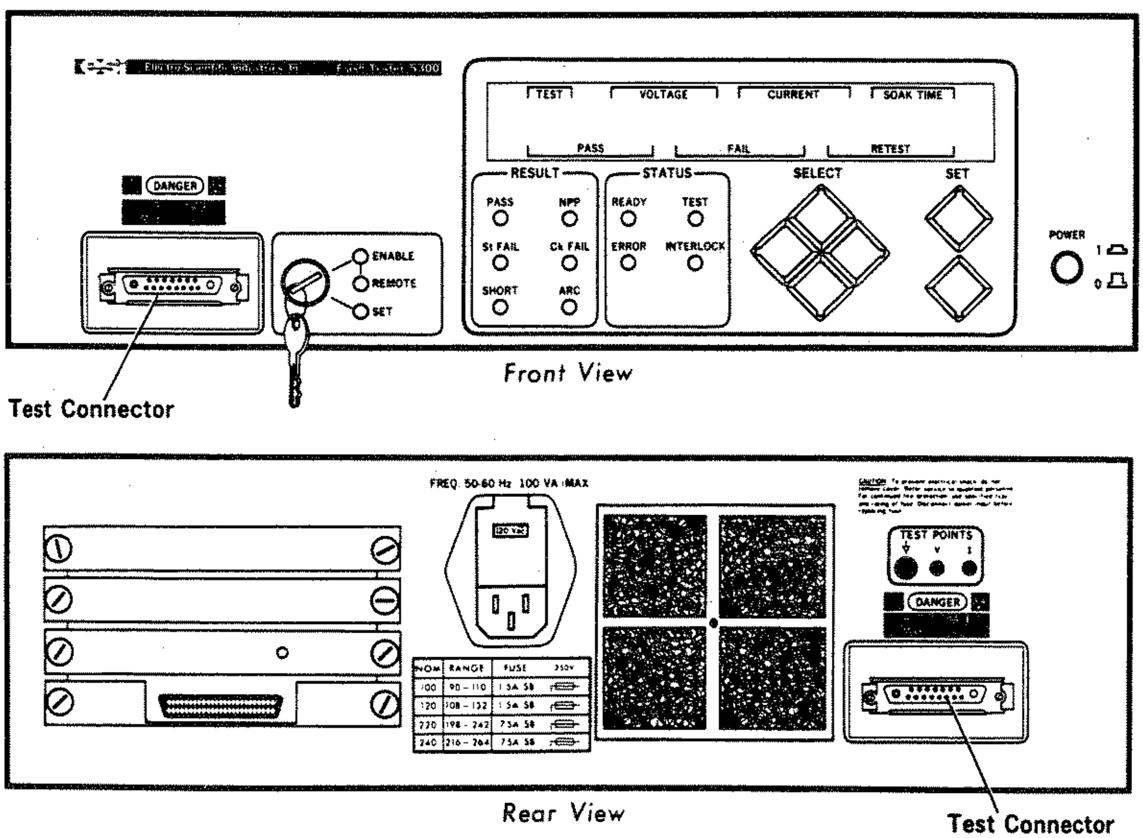


Figure 7-4. Test Connector Locations

STEP 3. Verify that the access keyswitch is in the ENABLE position. Refer to Figure 7-5.

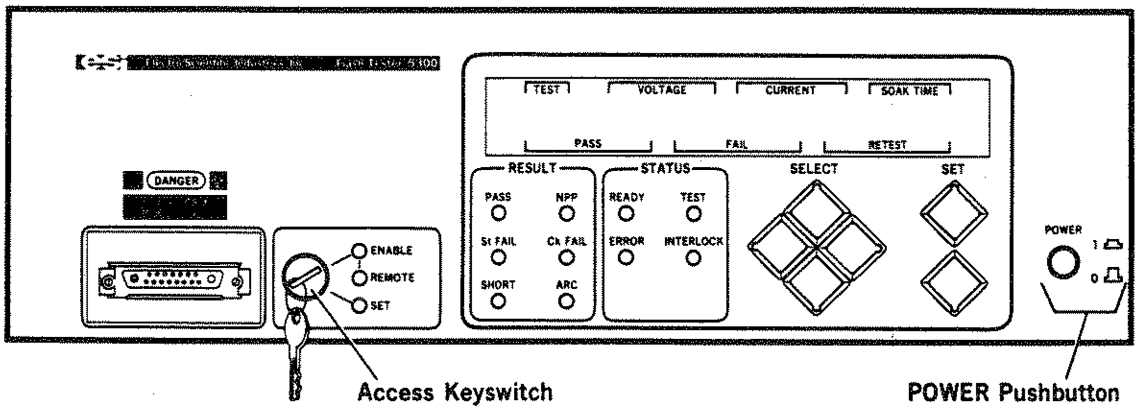


Figure 7-5. Access Keyswitch and POWER Pushbutton

STEP 4. Press the POWER pushbutton to turn the instrument to 1 (on). Refer to Figure 7-5 for the location of this switch.

STEP 5. As the instrument cycles through its power-up sequence, it should briefly illuminate all LEDs and all segments in the display. When the cycle is done, the following should be illuminated: ENABLE LED, INTERLOCK LED, the LEDs on the UP and DOWN pushbuttons, and the 20-character display. Refer to Figure 7-6 for an illustration of this condition. With the exception of the numbers in the display, the instrument should appear exactly as in Figure 7-6.

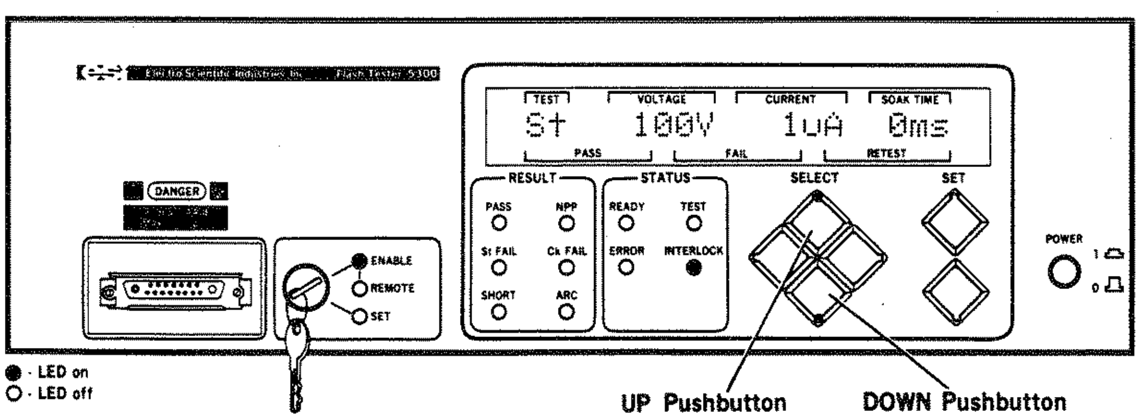


Figure 7-6. Front Panel Following Power-Up Sequence

STEP 6. Press the DOWN pushbutton once. The LED on this pushbutton should be illuminated. The characters at the left end of the display should change from St to Ck and the other entries in the display may also change, as indicated in Figure 7-7.

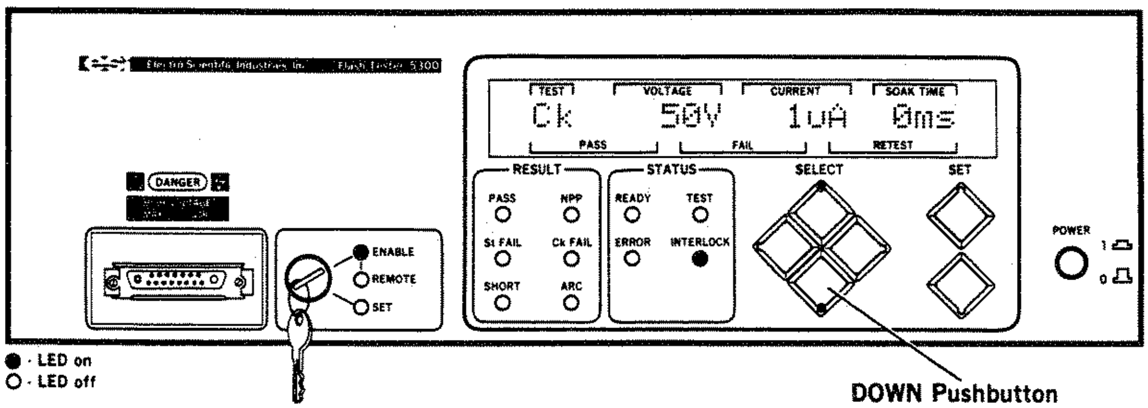


Figure 7-7. Front Panel After Pressing DOWN

STEP 7. Press the POWER button to turn the power to 0 (off). Disconnect the line cord from the source of line power. The Preliminary Checkout is complete.

7.4 TEST CABLE ASSEMBLY

Connection to the Device-Under-Test (DUT) is accomplished through the Test cable assembly that must be connected to the test connector. This connector can be mounted on the front or rear of the instrument.

Connections must be made with this cable to carry the High Voltage Output signal, the Sense Input signal, and the Interlock signals. Table 7-1 provides the pin assignments and wire colors for this cable.

There are two optional connections that can be made through this cable. A Start input is provided to allow the initiation of tests where neither the Handler Interface nor a communication interface are used for this purpose. A Result (Pass/Fail) output is provided to drive a pair of LEDs to indicate the test result.

WARNING

DO NOT ATTEMPT TO LENGTHEN THE TEST CABLE ASSEMBLY. LENGTHENING THE COAXIAL CABLES CAN PRODUCE A SERIOUS HAZARD THAT MAY EXPOSE THE USER TO POTENTIALLY LETHAL VOLTAGES. THIS HAZARD CAN CAUSE SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE. CONTACT ESI IF A LONGER CABLE IS NEEDED.

Table 7-1. Test Cable Pin Assignments

Pin	Function	Wire Color
1	Common	Black
2	No Connection	
3	Start	White/Blue
4	Result	White/Green
5	Interlock 2	White/Yellow
6	No Connection	
7	Frame Ground	Green
8	No Connection	
9	No Connection	
10	Interlock 1	White/Brown
11	No Connection	
12	No Connection	
13	No Connection	
14	Frame Ground	
15	HV Shield	
HV Connector	HV Output	Large Coax
Coax Connector	Sense Input	Small Coax

7.4.1 Mounting the Test Connector

Before the Test cable assembly is connected, the test connector should be mounted in the appropriate location on the front or rear panel. Refer to Figure 7-8 for the two alternate locations of this connector. If the connector is already in the desired location, this section can be skipped.

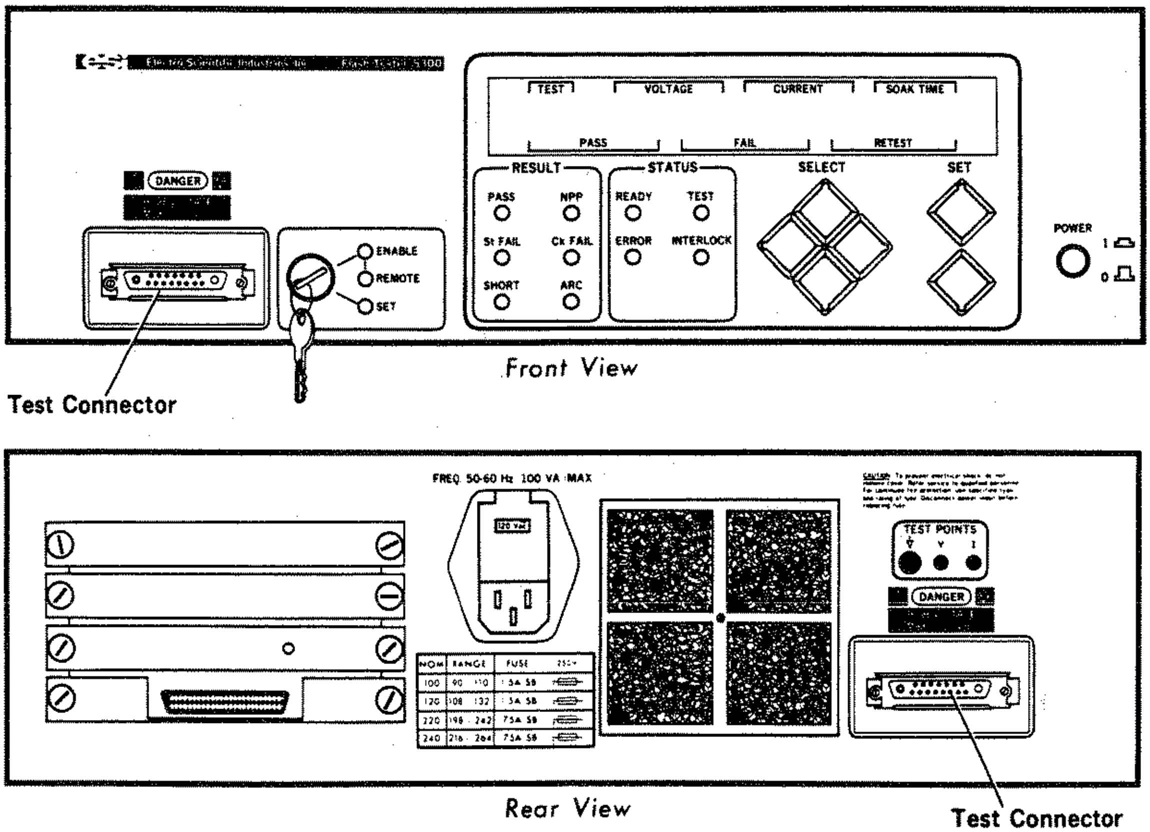


Figure 7-8. Test Connector Locations

7.4.1.1 Preparing the Instrument

Before the Test connector can be relocated, several covers must be removed from the 5300 to gain access to the connector and cable. The following procedure describes this process.

DANGER

BEFORE BEGINNING THE FOLLOWING PROCEDURE, VERIFY THAT THE INSTRUMENT LINE CORD HAS BEEN REMOVED FROM THE INSTRUMENT. FAILURE TO DO SO MAY EXPOSE POTENTIALLY LETHAL HIGH VOLTAGE. FAILURE TO REMOVE THE LINE CORD MAY RESULT IN SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

STEP 1. Remove the line cord from the instrument.

STEP 2. Lay the 5300 on its top cover. Remove the two screws that secure the bottom cover to the 5300. Slide the cover back to remove it from the instrument. Refer to Figure 7-9.

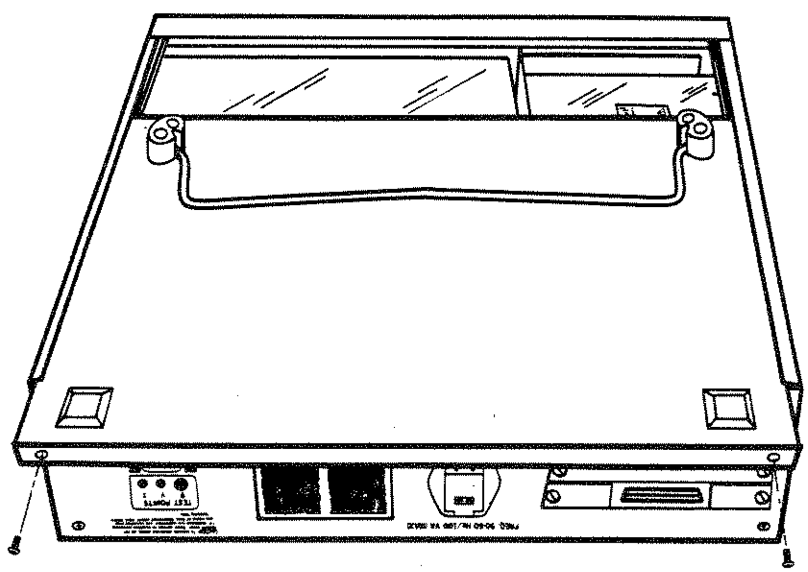


Figure 7-9. Removing the Bottom Cover

STEP 3. Turn the instrument over and remove the two screws that secure the top cover to the 5300. Slide the cover back to remove it from the instrument. Refer to Figure 7-10.

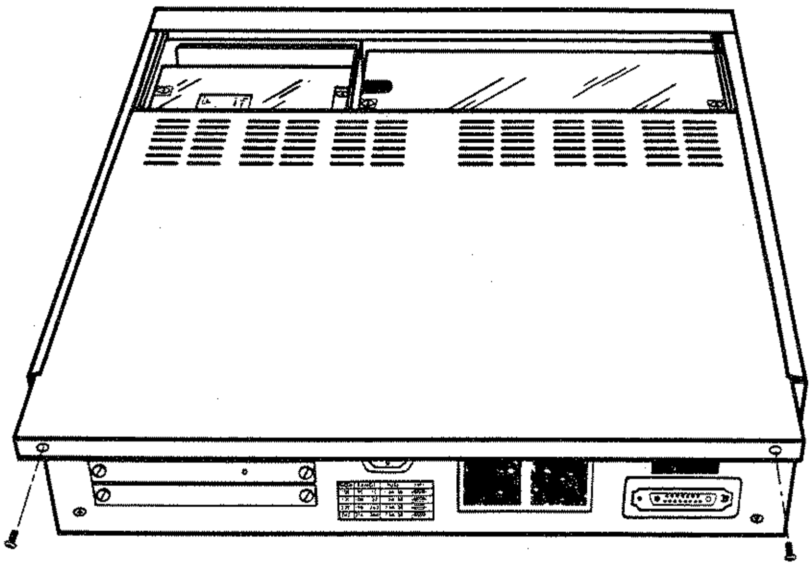


Figure 7-10. Removing the Top Cover

STEP 4. Remove the 4 screws that secure the Low Voltage Shock Shield and remove the shield. Refer to Figure 7-11.

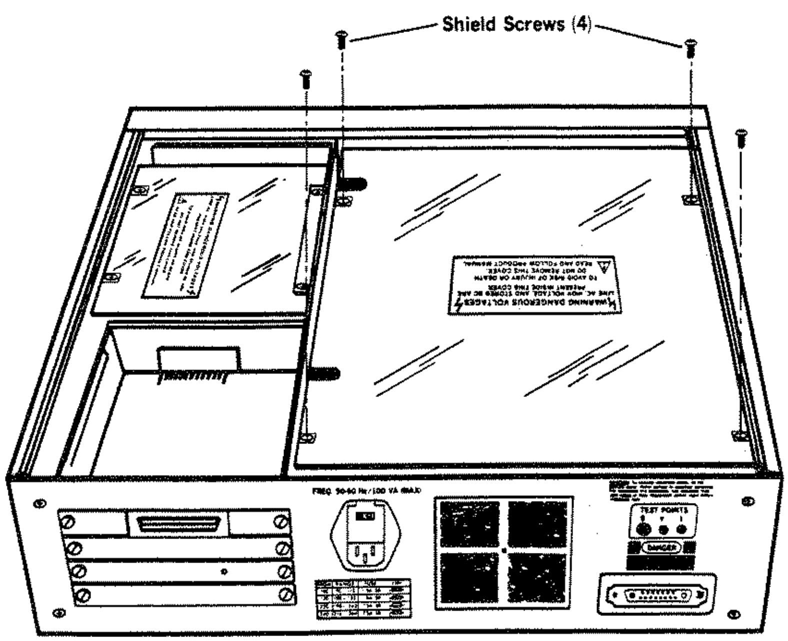


Figure 7-11. Removing the Low Voltage Shock Shield

STEP 5. Remove the 6 screws that secure the Low Voltage circuit assembly. Refer to Figure 7-12.

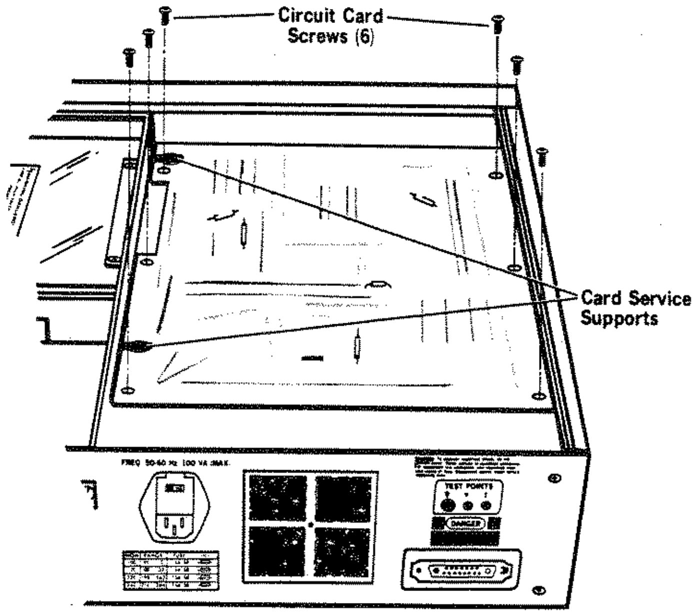


Figure 7-12. Removing the Low Voltage Circuit Assembly Screws

STEP 6. The Low Voltage circuit assembly must be raised and secured in the up (vertical) position. **Carefully** lift the right-hand side of the circuit assembly (as viewed from the rear) until the circuit assembly is vertical.

STEP 7. Push the Low Voltage circuit assembly over the two Card Service Supports. Turn the screw heads on each support 90° (1/4 turn) clockwise to secure the circuit assembly. Refer to Figure 7-13. The preparation for moving the Test connector and cable is complete. Proceed to the appropriate section (7.4.1.2 or 7.4.1.3) that follows for the procedure for moving the connector and cable.

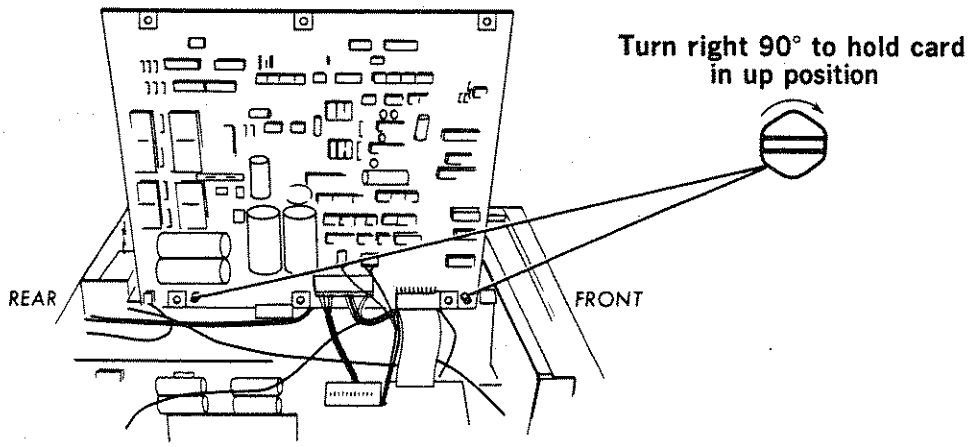


Figure 7-13. Securing the Low Voltage Circuit Assembly

7.4.1.2 Moving the Test Connector from the Front to the Rear

STEP 1. Prepare the instrument as described in Preparing the Instrument, Section 7.4.1.1.

STEP 2. Remove the two nuts and lockwashers that secure the Test connector and plate in place. Refer to Figure 7-14.

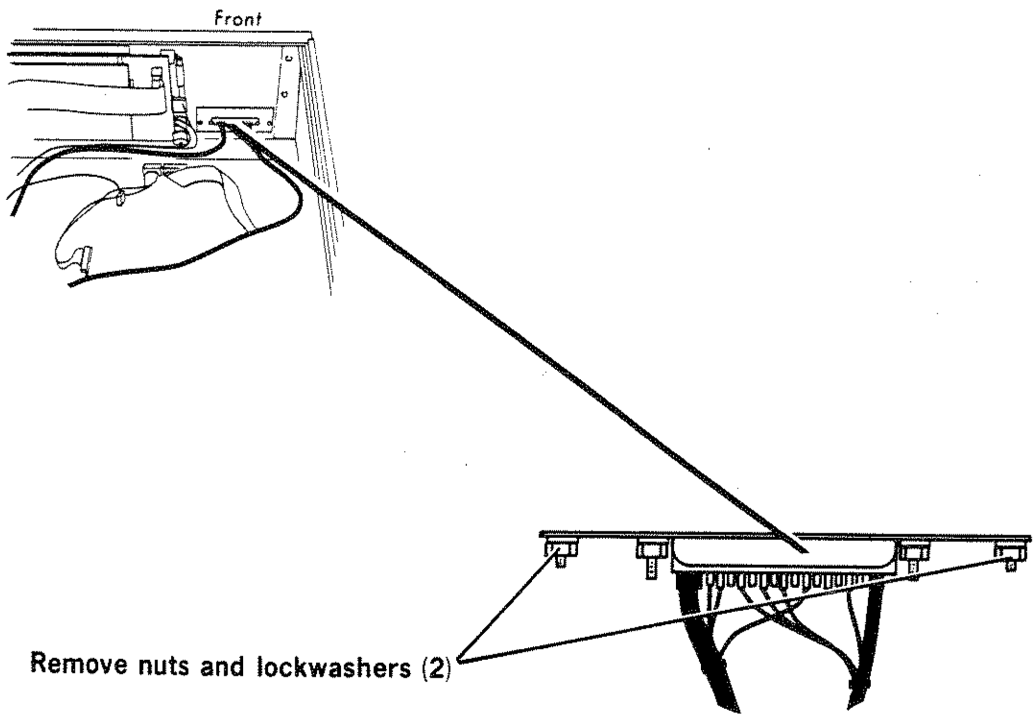


Figure 7-14. Unbolting the Test Connector

STEP 3. Disconnect plug P8 from the connector J8 on the High Voltage circuit assembly. Refer to Figure 7-15.

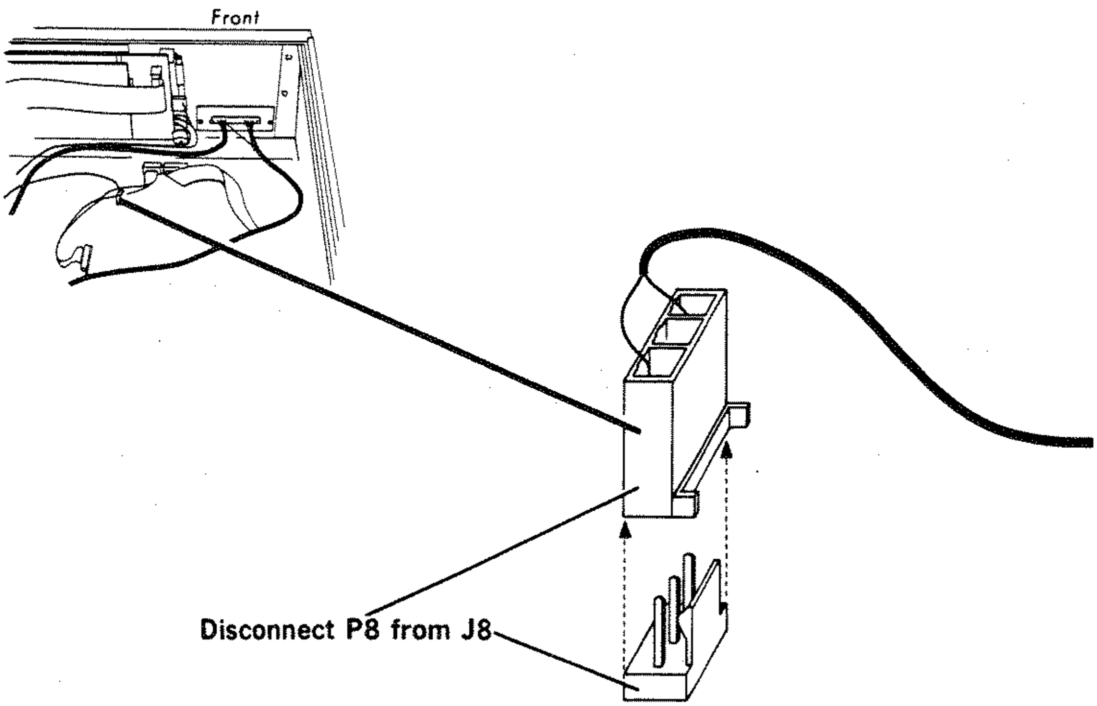


Figure 7-15. Disconnecting P8

STEP 4. Carefully lift the Test connector and cables away from the front location.

STEP 5. Remove the two nuts and lockwashers that secure the blank panel in the rear Test connector location. Move the blank panel to the front Test connector location and bolt it in place. Refer to Figure 7-16.

DANGER

THE BLANK PANEL MUST BE INSTALLED IN THE UNUSED LOCATION TO PREVENT ACCESS TO THE INTERNAL CIRCUITRY OF THE INSTRUMENT. FAILURE TO INSTALL THIS PLATE COULD RESULT IN SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

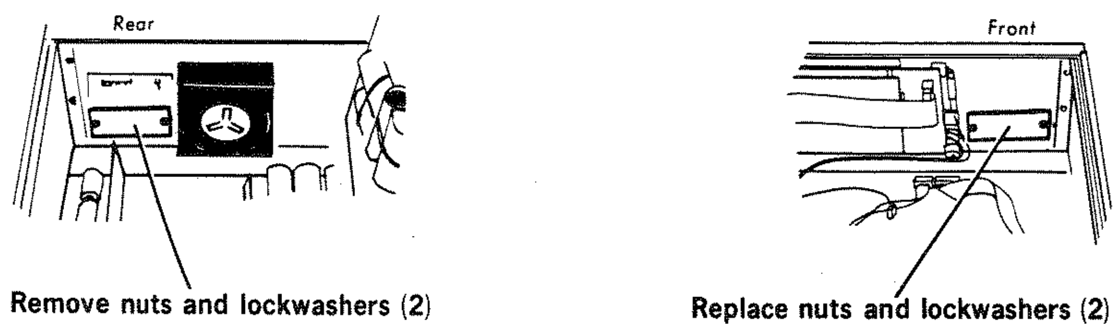


Figure 7-16. Moving the Blank Panel

STEP 6. Bolt the Test connector in place in the rear of the instrument. Refer to Figure 7-17. Be careful to follow the cable routing shown in the figure.

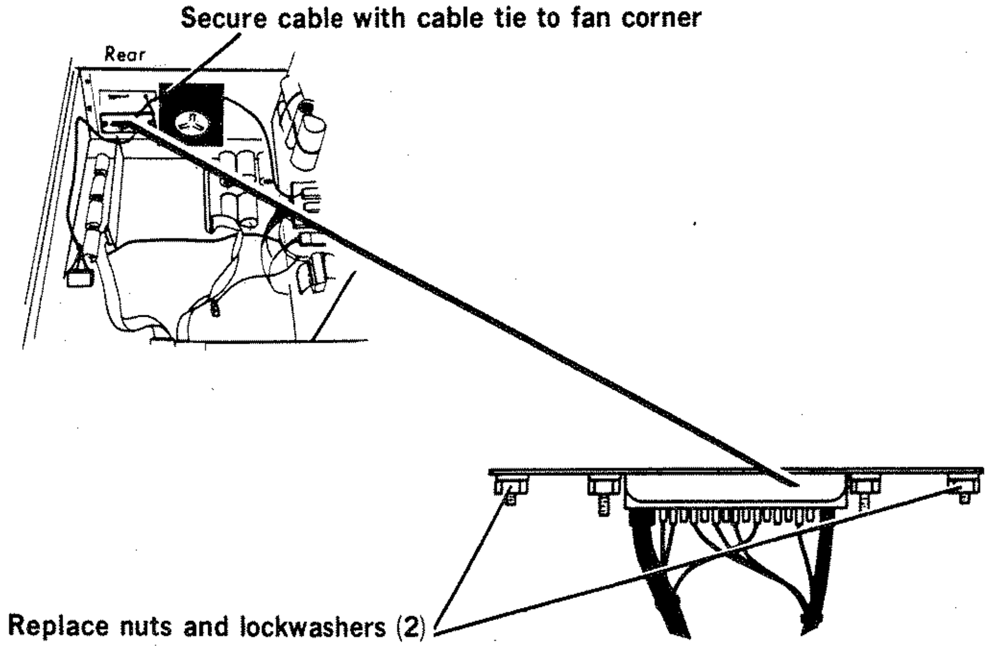


Figure 7-17. Attaching the Test Connector to the Rear Location

STEP 7. Secure the cables that route over the fan using the cable tie supplied with the instrument. Refer to Figure 7-17.

STEP 8. Reconnect P8 to J8. Refer to Figure 7-18.

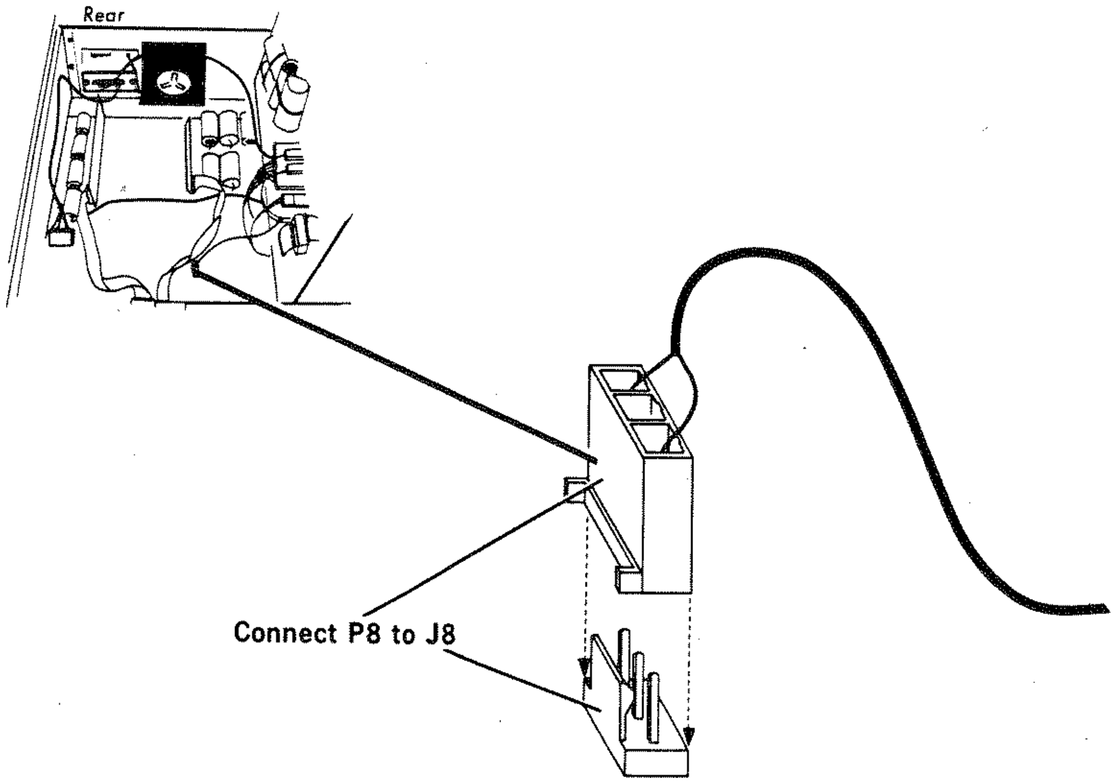


Figure 7-18. Reconnecting P8 to J8

STEP 9. Installation of the Test connector and cables is complete. Proceed to Reassembling the Instrument, Section 7.4.1.4.

7.4.1.3 Moving the Test Connector from the Rear to the Front

STEP 1. Prepare the instrument as described in Preparing the Instrument, Section 7.4.1.1.

STEP 2. Remove the two nuts and lockwashers that secure the Test connector and plate in place. Refer to Figure 7-19.

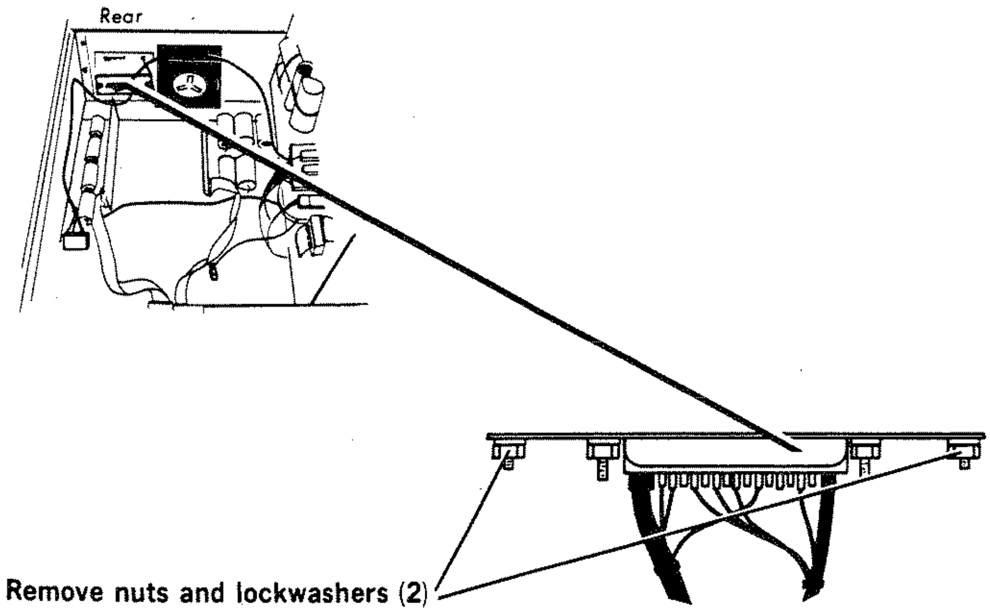


Figure 7-19. Unbolting the Test Connector

STEP 3. Disconnect plug P8 from the connector J8 on the High Voltage circuit assembly. Refer to Figure 7-20.

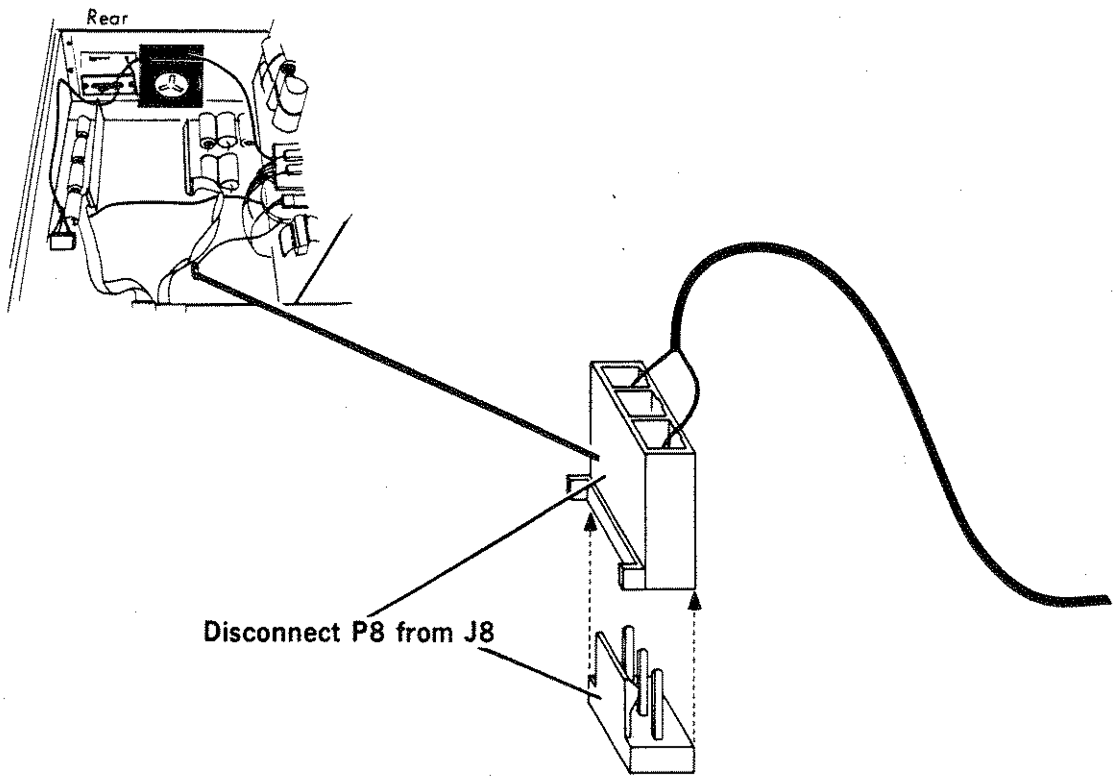


Figure 7-20. Disconnecting P8

STEP 4. Carefully lift the Test connector and cables away from the rear location.

STEP 5. Remove the two nuts and lockwashers that secure the blank panel in the front Test connector location. Move the blank panel to the rear Test connector location and bolt it in place. Refer to Figure 7-21.

DANGER

THE BLANK PANEL MUST BE INSTALLED IN THE UNUSED LOCATION TO PREVENT ACCESS TO THE INTERNAL CIRCUITRY OF THE INSTRUMENT. FAILURE TO INSTALL THIS PLATE COULD RESULT IN SERIOUS INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

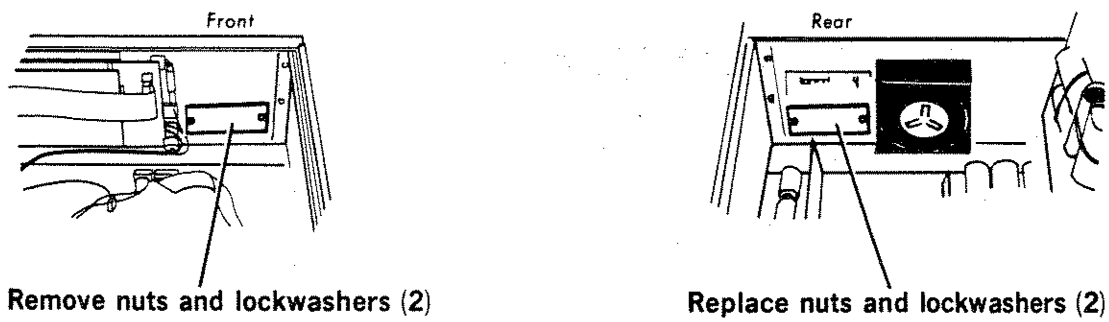


Figure 7-21. Moving the Blank Panel

STEP 6. Bolt the Test connector in place in the front of the instrument. Refer to Figure 7-22. Be careful to follow the cable routing shown in the figure.

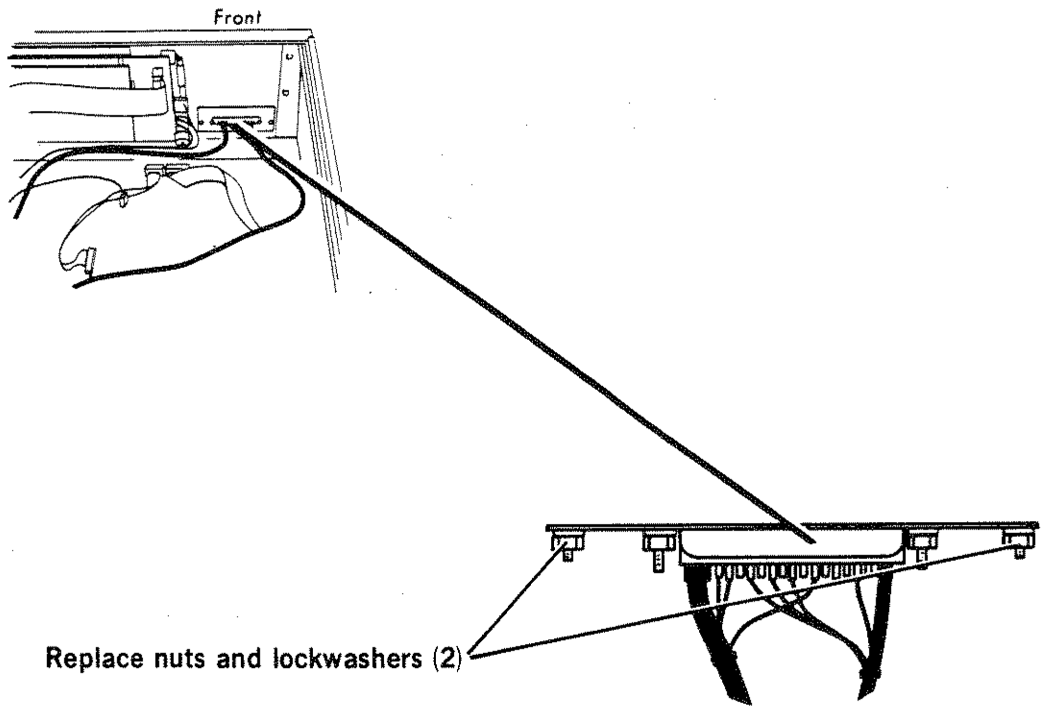


Figure 7-22. Attaching the Test Connector to the Front Location

STEP 7. Reconnect P8 to J8. Refer to Figure 7-23.

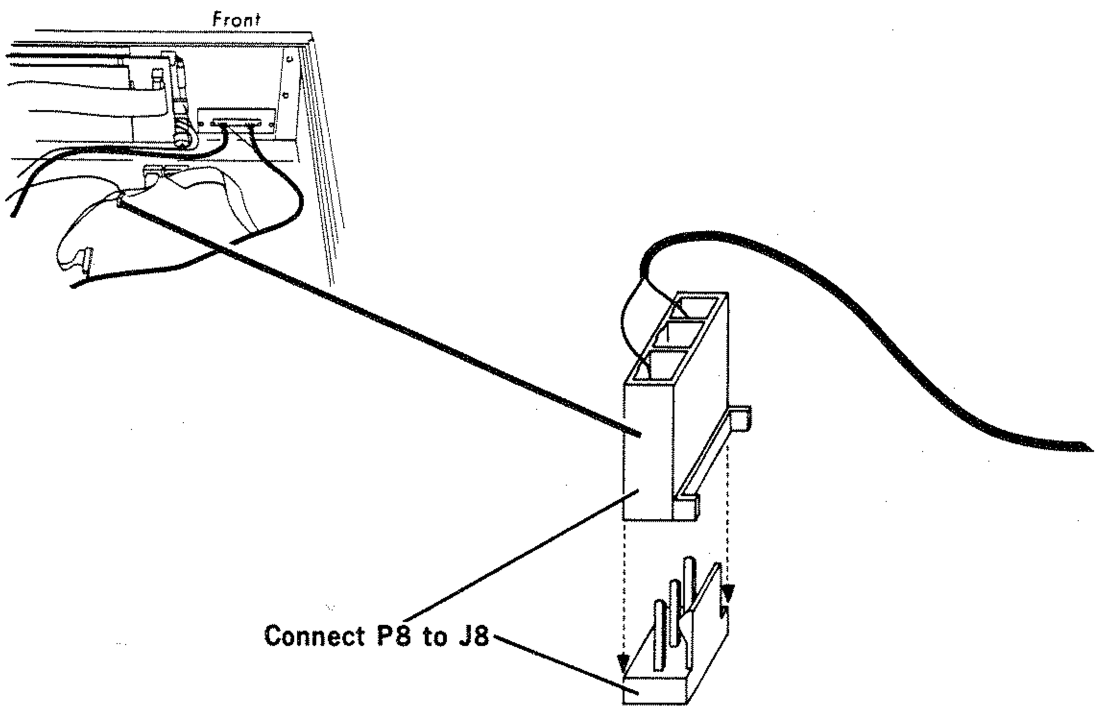


Figure 7-23. Reconnecting P8 to J8

STEP 8. Installation of the Test connector and cables is complete. Proceed to Reassembling the Instrument, Section 7.4.1.4.

7.4.1.4 Reassembling the Instrument

Once the Test connector and cables have been moved to the desired location, the shield and panels of the instrument must be replaced on the instrument. This is done as follows.

STEP 1. Rotate the screw heads on each of the Card Service Supports 90° (1/4 turn) counter-clockwise. **Carefully** remove the circuit assembly from the supports by pulling the assembly away from the supports while pushing the supports through the circuit assembly. Refer to Figure 7-24.

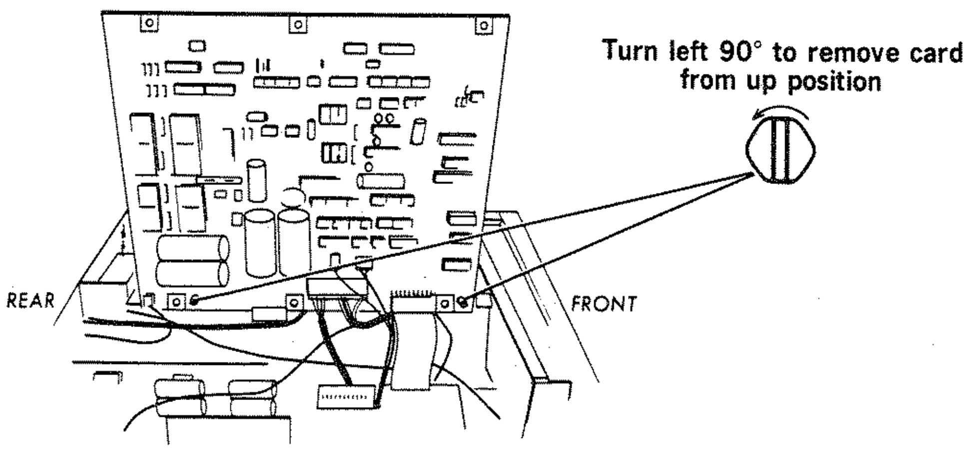


Figure 7-24. Disconnecting the Low Voltage Circuit Assembly from the Supports

STEP 2. Lower the Low Voltage circuit assembly in place and secure it using the 6 screws that originally held it. Refer to Figure 7-25.

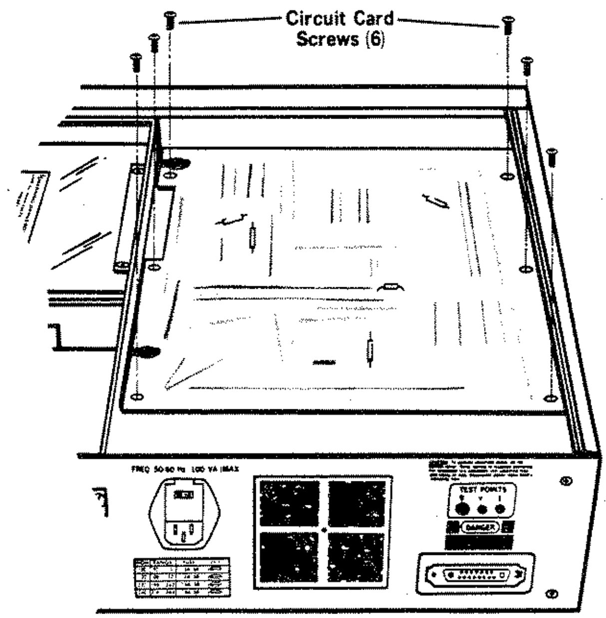


Figure 7-25. Securing the Low Voltage Circuit Assembly

STEP 3. Replace the Low Voltage Shock Shield and secure it using the 4 screws that originally held it. Refer to Figure 7-26.

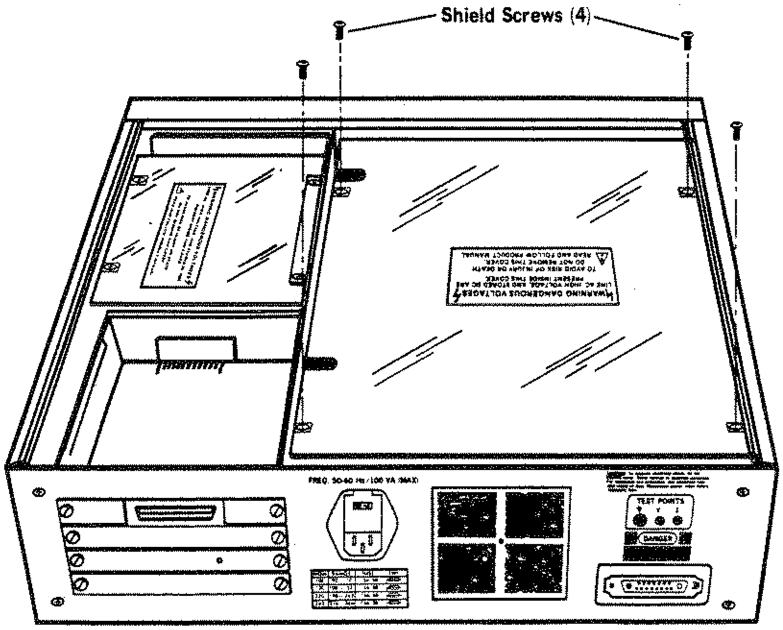


Figure 7-26. Replacing the Low Voltage Shock Shield

WARNING

IT IS ESSENTIAL THAT THE LOW VOLTAGE SHOCK SHIELD IS REPLACED AS DESCRIBED IN THE PRECEDING STEP. FAILURE TO REPLACE THIS SHIELD CAN RESULT IN A HAZARDOUS CONDITION WHEN THE TOP COVER IS NOT IN PLACE.

STEP 4. Slide the top cover back in place and secure it with the two screws that originally held it. Refer to Figure 7-27.

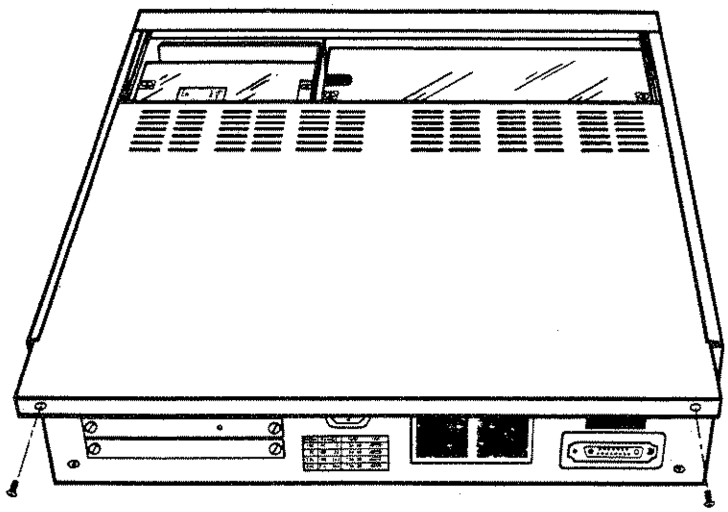


Figure 7-27. Replacing the Top Cover

STEP 5. Turn the instrument over and slide the bottom cover back in place. Secure the cover using the two screws that originally held it. Refer to Figure 7-28.

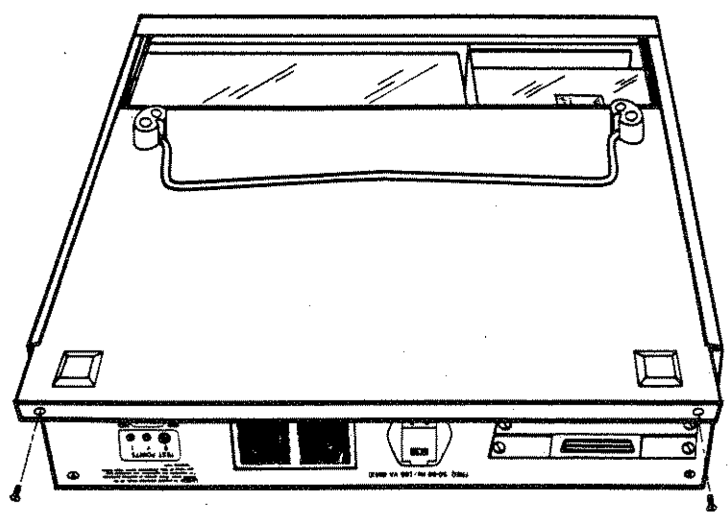


Figure 7-28. Replacing the Bottom Cover

STEP 6. Turn the instrument over. The installation of the Test connector is complete.

7.4.2 Test Signals

Two of the cables in the test cable are coaxial cables. The larger cable carries the HV Output signal. The smaller cable carries the Sense Input signal. These cables must be connected to the test head probes such that they contact either side of the DUT. Their shields must be insulated from each other and from contacting any other conductor. There is a Ground wire in the test cable that must be connected to the Chassis Ground of the test head. The following procedure describes these connections.

STEP 1. Verify that the Test cable assembly is not connected to the 5300.

NOTE: Only minimum or maximum dimensions are listed in the following steps. The actual dimensions required are determined by the needs of the test head.

STEP 2. Locate the smaller coaxial cable from within the test cable. Strip the outer insulation up to 2 inches from the end of the cable. Refer to Figure 7-29a.

STEP 3. Strip the shield and inner insulation, leaving at least 1/2 inch of shield and insulation exposed. Refer to Figure 7-29b.

STEP 4. Using diagonal cutters or scissors, trim away **all** of the exposed shield. Refer to Figure 7-29c.

CAUTION

IT IS NECESSARY THAT AT LEAST 1/2 INCH OF INNER INSULATION REMAINS TO PROVIDE ADEQUATE AIR GAP BETWEEN THE SHIELD AND THE INNER CONDUCTOR. NO MORE THAN 2 INCHES OF INNER CONDUCTOR SHOULD EXTEND PAST THE END OF THE SHIELD TO MINIMIZE NOISE PICKUP. IN ADDITION, EXTREME CARE SHOULD BE FOLLOWED WHEN TRIMMING THE SHIELD TO ENSURE THAT THE INNER CONDUCTOR IS NOT CUT OR NICKED.

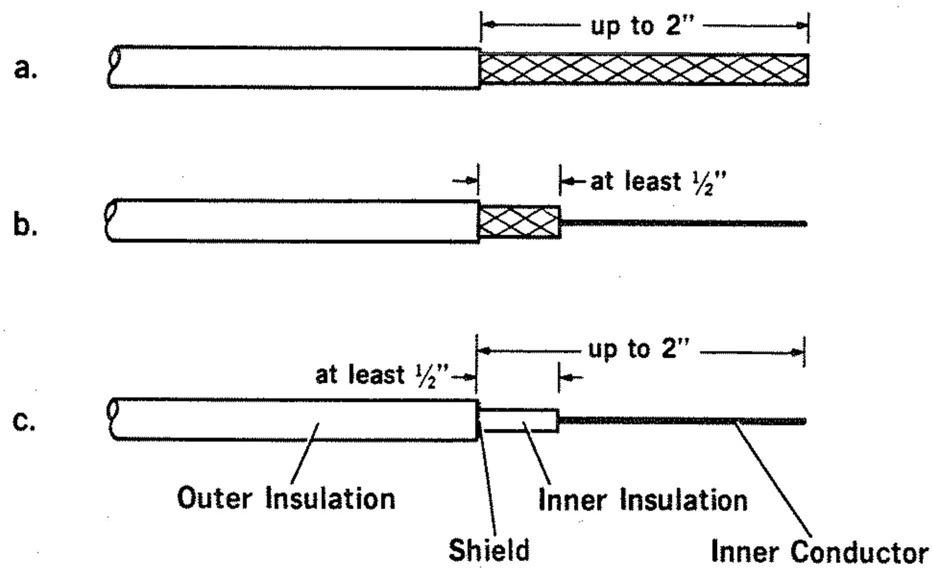


Figure 7-29. Preparing the Coaxial Cables

STEP 5. Locate the larger coaxial cable from within the test cable. Strip the cable in a similar manner as that used for the smaller coaxial cable.

STEP 6. There should be two probes on the test head that will contact the DUT. Connect the center conductor of the smaller coaxial cable to one of the probes. If one probe is more accessible when the cover is open, this probe should be used in this step.

STEP 7. Connect the center conductor of the larger (high voltage) coaxial cable to the other probe on the test head.

STEP 8. Connect the green (Ground) wire from the test cable to the Chassis Ground of the test head.

7.4.3 Result and Start Signals

There are two optional control signals that pass through the test cable: Result and Start. The Result signal is output to identify the Pass or Fail status of the preceding test. The Start signal is input to request the start of a test. The Start input is the only way to initiate a normal test if neither the Handler Interface nor a communication interface is installed. The following sections describe the installation of the devices required to make use of these signals.

7.4.3.1 Result LED Installation

The Result output provides a signal that can drive a pair of LEDs directly (without current-limiting resistors). In this installation example, it is assumed that a red LED is used to indicate a failed DUT and a green LED is used to indicate a passing DUT. LEDs should be selected that illuminate properly with about 10 milliamperes of current. Figure 7-30 provides a schematic of this connection.

STEP 1. Verify that the Test cable assembly is **not** connected to the 5300.

STEP 2. Connect the anode of the green LED to the cathode of the red LED. Connect the white-with-green-stripe wire (of the test cable) to this junction.

STEP 3. Connect the cathode of the green LED to the anode of the red LED. Connect a wire from this junction to the black wire of the test cable.

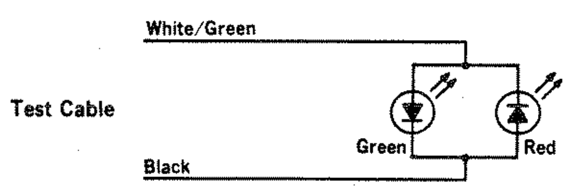


Figure 7-30. Result LEDs

7.4.3.2 Start Switch Installation

To initiate a test without using the Handler Interface or a communication interface, a Start switch (SPST NO) must be installed to the test cable. This switch must connect the Start input to ground to initiate a test. The following describes this procedure. Figure 7-31 provides a schematic of this connection.

STEP 1. Obtain a single-pole, single-throw, normally-open (SPST NO) pushbutton switch.

STEP 2. Verify that the Test cable assembly is **not** connected to the 5300.

STEP 3. Connect the white-with-blue-stripe wire (of the test cable) to one side of this switch.

STEP 4. Connect a wire from the other side of this switch to the black wire of the test cable.

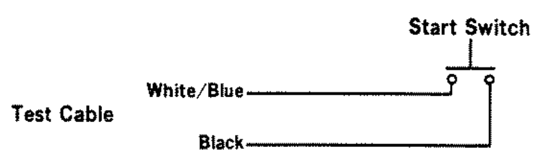


Figure 7-31. Start Switch

7.4.4 Interlock System Connections

There are two independent interlock systems on this instrument. The installer must connect the interlock inputs on the test connector to switches (SPST NO) that are open whenever the test probes on the test head are exposed. When the test probes are safely covered, the switches connect to Common. These switches are typically located under a cover around the test head such that the cover must be closed to close the switches. The 5300 will not accept a Start signal as long as the interlock system is open. The following describes the installation of these switches.

7.4.4.1 Interlock Installation Safety Requirements

To ensure the integrity of the interlock system, proper installation rules must be followed. As the 5300 is designed to be installed to a variety of handlers and test heads, it is not practical to provide detailed instructions for all equipment. This section provides rules, compiled from UL and VDE regulations, that **must** be followed by the installer.

WARNING

FAILURE TO FOLLOW THESE RULES CAN RESULT IN A HAZARDOUS INSTALLATION. SUCH ACTION CAN LEAD TO SERIOUS INJURY AND/OR DEATH IF CONTACT IS MADE WITH HIGH VOLTAGE.

1) Safety interlocks shall protect operators and service technicians from exposure to hazardous conditions or areas.

2) Safety interlocks shall require an intentional operation to bypass.

3) Removing or opening the interlock cover shall remove the associated hazard.

4) Equipment shall not be operable unless the interlock function is restored and the covers are closed.

5) When located within an operator-accessible area, an interlock shall not be operable by a test finger, with a coin, or by hand.

6) Design of the interlock system shall be such that the failure of any one component within the system shall not create a hazard, or it shall be determined by testing that failure is not likely to occur during the normal life of the instrument. For this instrument, the installer must ensure that the selection and installation of the interlock switches meet this requirement.

7.4.4.2 Interlock Switch Installation Procedure

DANGER

FAILURE TO PROPERLY INSTALL AND TEST THE INTERLOCK SYSTEM MAY RESULT IN SEVERE INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE. EXTREME CARE MUST BE FOLLOWED TO ENSURE THAT THE INSTALLATION INSTRUCTIONS ARE FOLLOWED CORRECTLY.

STEP 1. Obtain two single-pole, single-throw, normally-open (SPST NO) switches. These switches are referred to as Switch A and Switch B in this procedure. These switches must be UL listed or VDE approved for use in this type of application. They must be specified to operate up to 10 volts DC and 500 milliamperes (dry circuit) for at least one million cycles.

STEP 2. Install the two switches on the handler and test head such that both switches are open whenever any live component is not completely shielded from the operator. Observe the guidelines in the preceding section.

STEP 3. Verify that the Test cable assembly is **not** connected to the 5300.

STEP 4. Connect the white-with-yellow-stripe wire from pin 5 (Interlock 2) of the test connector to one side of Switch B.

STEP 5. Connect the white-with-brown-stripe wire from pin 10 (Interlock 1) of the test connector to one side of Switch A.

STEP 6. Connect the black wire from pin 1 (Common) of the test connector to the unconnected side of both switches.

STEP 7. Verify that there are exactly two wires (black and white/brown to Switch A and black and white/yellow to Switch B) to each switch.

7.4.4.3 Testing the Interlock Connection

Once the interlock switches have been installed, both must be tested for proper operation. This is done as follows.

DANGER

DO NOT ATTEMPT TO OPERATE THE INSTRUMENT UNTIL THIS INTERLOCK TEST HAS BEEN SUCCESSFULLY PERFORMED. FAILURE TO DO SO CAN RESULT IN SEVERE INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

STEP 1. Verify that there are no connections to the test connector on the instrument. Refer to Figure 7-32 for the two possible locations of this connector.

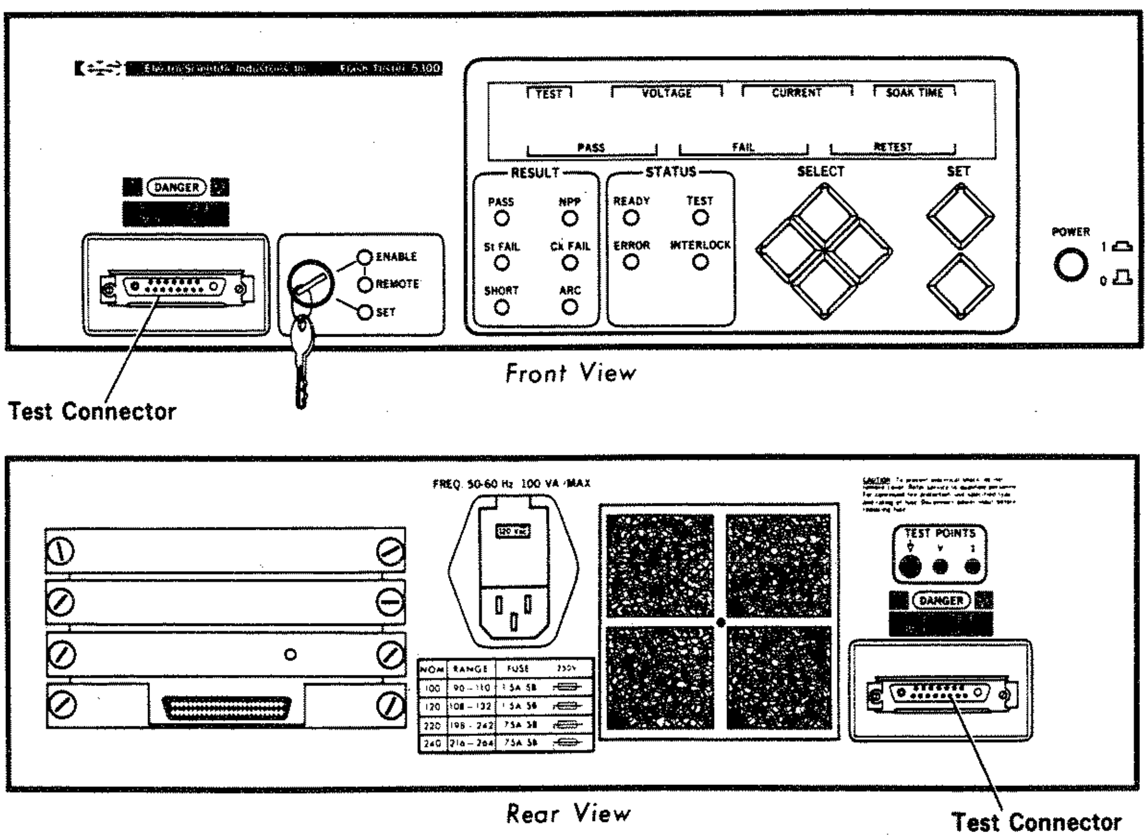


Figure 7-32. Test Connector Locations

STEP 2. Close the cover on the handler and test head. Plug the 5300 into a source of line power. Press the POWER button to turn the instrument to 1 (on). Refer to Figure 7-33 for the location of the POWER button.

DANGER

IF THE STATUS OF THE INTERLOCK LED IS OTHER THAN EXPECTED IN THE FOLLOWING STEPS, TURN THE POWER SWITCH OFF IMMEDIATELY REMOVE THE POWER CORD, AND RECHECK THE WIRING OF THE INTERLOCK SWITCHES. FAILURE TO DO SO CAN RESULT IN SEVERE INJURY AND/OR DEATH FROM CONTACT WITH HIGH VOLTAGE.

STEP 3. Observe that the INTERLOCK LED is illuminated, indicating that the Interlock system is open. Refer to Figure 7-33 for the location of the INTERLOCK LED.

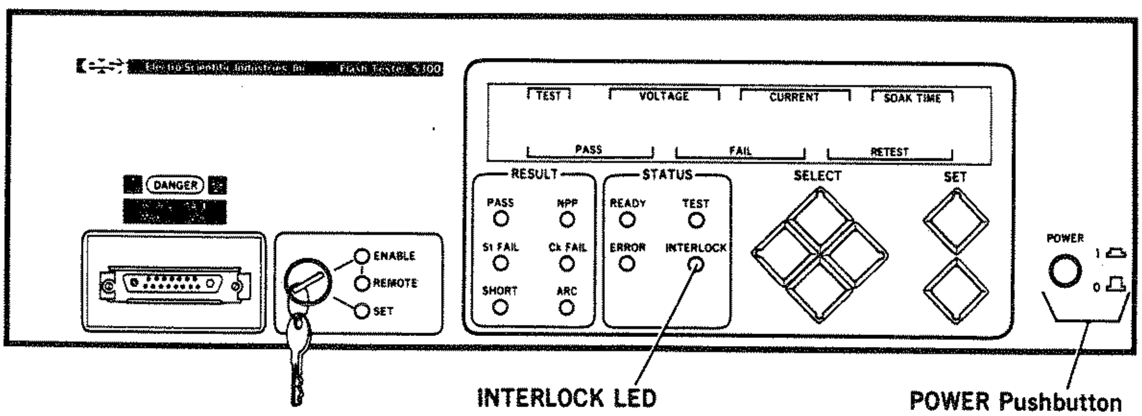


Figure 7-33. Location of POWER Button and INTERLOCK LED

STEP 4. Plug the test cable into the test connector. Refer to Figure 7-32 for the two possible locations of this connector.

STEP 5. When the Test cable is connected to the 5300, the INTERLOCK LED on the 5300 should turn off and the internal interlock relay should click once, indicating that both interlock switches are closed.

STEP 6. Open the cover on the handler and test head. The INTERLOCK LED on the 5300 should illuminate and the interlock relay should click once, indicating that the interlock system is open.

STEP 7. Close the cover on the handler and test head. The INTERLOCK LED should illuminate and the relay should click.

STEP 8. Unplug the Test cable from the 5300. Verify that the relay clicks once as the cable is disconnected.

STEP 9. Reconnect the Test cable to the 5300. Verify that the relay clicks again.

STEP 10. Secure the Test cable to the Test connector by sliding the clip to the left, as indicated in Figure 7-34.

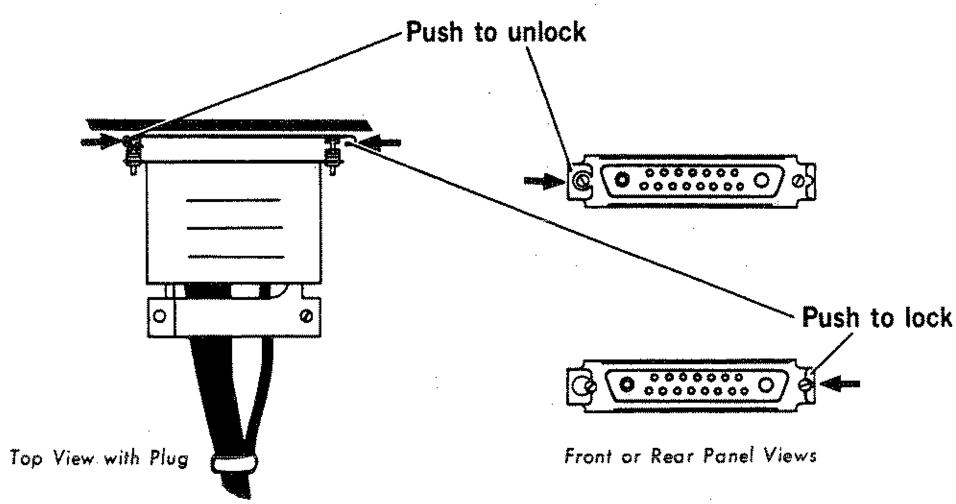


Figure 7-34. Test Connector Clip

STEP 11. Press the POWER pushbutton to turn the instrument to O (off).

STEP 12. Disconnect the power cord from the source of line power.

7.5 OPTIONAL INTERFACE MECHANICAL INSTALLATION

The optional interfaces may be installed in any of the circuit assembly slots located in the rear of the instrument. Figure 7-35 indicates the location of these slots. As there are no switches or jumpers on any of these interfaces, nothing must be done to the interface itself before installation. The procedure that follows describes the installation of an interface. For information regarding the electrical connections that must also be made, refer to the appropriate section that follows.

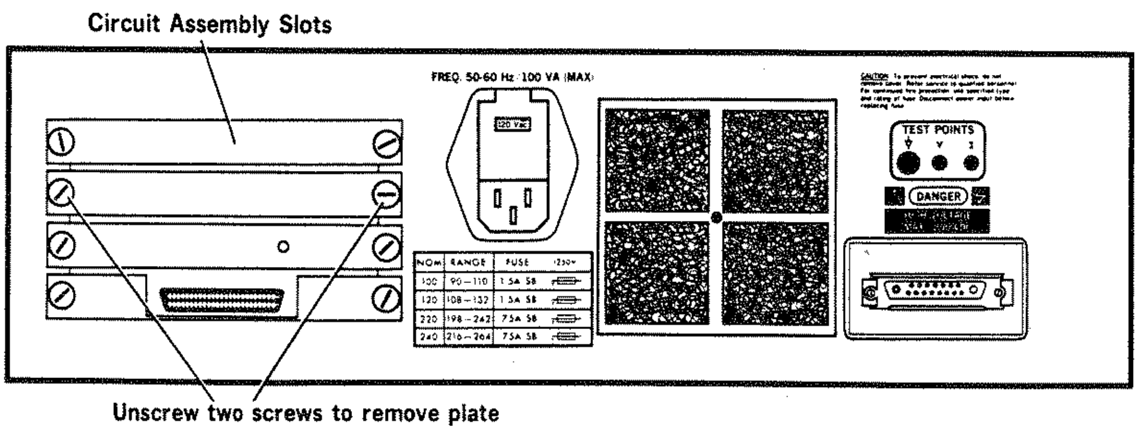


Figure 7-35. Circuit Assembly Slots

STEP 1. Verify that the POWER switch is on 0 (off) and the power cord is disconnected.

STEP 2. Unscrew the two screws that secure the plate that covers the particular circuit assembly slot in which the interface will be installed. Figure 7-35 identifies these screws.

STEP 3. Remove the plate. Save the plate and screws for future replacement in case the interface is removed.

STEP 4. Insert the interface in the circuit assembly slot, component side up, as shown in Figure 7-36.

STEP 5. Push the interface all of the way into the slot.

STEP 6. Tighten both screws to secure the interface.

STEP 7. Proceed to the appropriate section that follows to perform the necessary electrical connections.

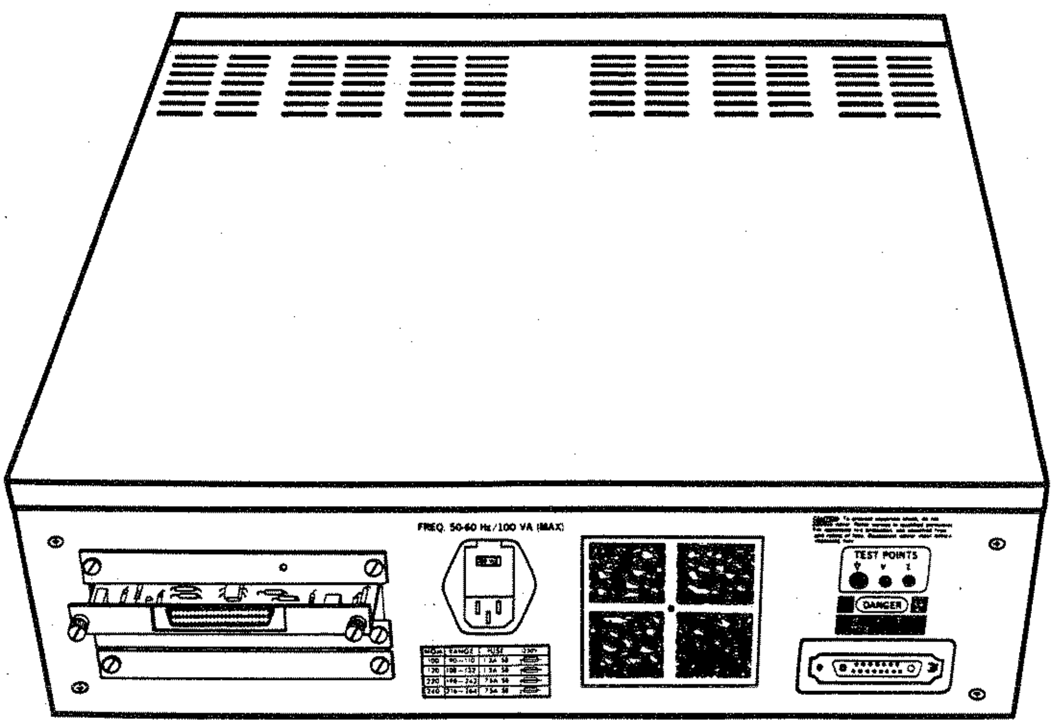


Figure 7-36. Installing an Interface

7.6 HANDLER INTERFACE CONNECTIONS

The optional Handler Interface provides inputs and outputs to allow a handler to gain control of the 5300, initiate a test, monitor the status of the test, and read the results of the test.

Within this section, the connections to the Handler Interface are divided into the following groups: power, results, and control. Each group of connections is covered separately.

There are two types of handlers that can be used with this Handler Interface: Basic and Smart. The distinction is made with regard to the method that the handler uses to initiate a test. A Smart handler must first request control of the instrument. A Basic handler simply requests a Start. For more information regarding Basic and Smart handlers, refer to HANDLER INTERFACE, Section 3.6.

The power and results connections are done in the same manner for either type of handler. The control connections are different. For this reason, the type of handler must be determined before the control connections can be made.

To make connections to the Handler Interface, the installer must obtain the appropriate connector. An Amphenol part number 57-10360 is an example of one that will serve this purpose.

7.6.1 Power Connections

The Handler Interface requires external sources of power for the inputs and outputs. This is done to allow proper isolation of the instrument from the handler.

> **NOTE:** Although separate power supplies are described for the inputs and outputs, a common supply can be used in some cases. If the noise on the output supply (-) is excessive, using a common supply will cause false triggering of the inputs. In this case, separate supplies **must** be used. If the output (-) is known to be quiet, a common supply can be used.

The outputs on the Handler Interface require a supply of 5 to 28 VDC. Both the + and - sides of this supply must be connected to the instrument.

> **NOTE:** The devices controlled by the outputs must **not** be supplied with a voltage greater than that connected to the Output Supply (+). Diodes in the Handler Interface connect the outputs to the Output Supply (+). Any voltage on the outputs exceeding this supply voltage will be clamped to the supply voltage by these diodes.

The inputs on the Handler Interface require only the (+) side of the supply. Each input is triggered by sinking current from the input pin to the (-) side of this supply.

Table 7-2 lists the pin assignments for the power connections.

Table 7-2. Handler Interface Power Connections

Cable Line Number	Connector Pin Number	Function
2	19	Output Supply (-)
3	2	Input Supply (+)
4	20	Output Supply (+)

7.6.2 Binning Connections

The Handler Interface has 8 binning output lines. These can be used in either of two modes: One-of-Nine or Binary. In the One-of-Nine mode, each test result is coded as either one output line active or no active outputs. This allows 9 different output states. This output mode would be more commonly used when the interface must drive the binning hardware directly.

In the Binary mode, only 5 output lines are used. The different test results are coded as 5-digit binary numbers. This output mode would be more commonly used when the interface must communicate with a Smart handler (or computer) that will control the binning hardware.

For information regarding the selection of output mode and codes for each test result, refer to HANDLER INTERFACE, Section 3.6. Information regarding the drive capabilities of the outputs is found in the same section.

Table 7-3 lists the pin assignments for the binning connections. They must be connected to the appropriate points on the handler.

Table 7-3. Handler Interface Binning Connections

Cable Line Number	Connector Pin Number	Output One-of-Nine	Output Binary
12	24	Bit 7 (MSB)	Not Used
13	7	Bit 6	Bit 4 (MSB)
14	25	Bit 5	Bit 3
15	8	Bit 4	Bit 2
16	26	Bit 3	Bit 1
17	9	Bit 2	Bit 0 (LSB)
18	27	Bit 1	Not Used
19	10	Bit 0 (LSB)	Not Used

7.6.3 Control Connections

Once the type of handler (Basic or Smart) has been identified, the control connections can be made. The following sections describe these connections for both types of handlers.

Power to the inputs is provided by a separate power supply. The inputs are triggered by connecting the input pin to the - side of this external supply. If a supply of greater than 5 VDC is used, current-limiting resistors must be used on each input pin. The approximate value of these resistors is calculated from the following equation:

$$R = (V_{supply} - 5\ V)/0.015\ A$$

Where:

V_{supply} is the voltage supplied to Input Supply (+)

0.015 A is the desired input current

Table 7-4 lists the appropriate resistor value for various supply voltages.

Table 7-4. Current-Limiting Resistor Values

Input Voltage (volts)	Resistor Value (ohms)
5 or 6	None Required
10	330
12	470
15	680
24	1.2 k
28	1.5 k

7.6.3.1 Control Connections to a Smart Handler

The following control lines are used with a Smart handler: Alive, Request, Active, Start, Busy1 and Busy2. For more information on the function of each of these lines, refer to HANDLER INTERFACE, Section 3.6.

Connection of the control lines involves identifying the appropriate point on the handler for each of the signals and connecting them to the connector, using a current-limiting resistor for supply voltages above 5 VDC. Table 7-5 lists the pin assignments for the control signals.

Once these control connections have been completed, the cable should be connected to the Handler Interface connector on the rear of the instrument.

Table 7-5. Handler Interface Control Connections to a Smart Handler

Cable Line Number	Connector Pin Number	Function
5	3	Request (input)
6	21	Start (input)
9	5	Active (output)
10	23	Busy1 (output)
11	6	Busy2 (output)
36	36	Alive (output)

7.6.3.2 Control Connections to a Basic Handler

The following control lines may be used with a Basic handler: Alive, Start, Busy1 and Busy2. For more information on the function of each of these lines, refer to HANDLER INTERFACE, Section 3.6.

Connection of the control lines involves identifying the appropriate point on the handler for each of the signals that are to be used and connecting them to the connector, using a current-limiting resistor for supply voltages above 5 VDC. Table 7-6 lists the pin assignments for the control signals.

Once these control connections have been completed, the cable should be connected to the Handler Interface connector on the rear of the instrument.

Table 7-6. Handler Interface Control Connections to a Basic Handler

Cable Line Number	Connector Pin Number	Function
6	21	Start (input)
10	23	Busy1 (output)
11	6	Busy2 (output)
36	36	Alive (output)

7.7 COMMUNICATION INTERFACES

There are several communication interfaces available for this instrument. Installation of each interface involves mechanical installation, electrical installation, and instrument configuration. The mechanical installation is the same for all interfaces and is described in OPTIONAL INTERFACE MECHANICAL INSTALLATION, Section 7.5. The electrical installation and instrument configuration is described in the following sections.

7.7.1 GPIB Interface

The GPIB Interface connector, located on the rear of the interface, follows the IEEE-488 (GPIB) standard. Electrical installation of this interface simply involves connecting a standard GPIB cable between this connector and a similar connector on the other GPIB device(s).

In order to communicate by means of GPIB, several configuration parameters must be set. Refer to GPIB, Section 3.7.1, for information on setting these parameters.

7.7.2 RS-232-C Interface

The RS-232-C Interface connector, a male DB-25 connector located on the rear of the interface, follows the EIA RS-232-C standard. The electrical installation of this interface consists of constructing a cable to connect the interface to the (DTE) computer. Information regarding the construction of this cable is contained in this section.

The cable must have a female DB-25 connector at both ends. An Amphenol 17-80250-15 or equivalent should work properly.

Instrument configuration for use with RS-232-C consists of setting several communication parameters. Refer to Serial, Section 3.7.2, for information on setting these parameters.

Before constructing the RS-232-C cable, the type of handshaking (software or hardware) to be used must be determined. For information on selecting the type of handshaking, refer to Handshaking, Section 3.7.2.2.

If software handshaking is selected, the cable requires only three wires and two jumpers. Table 7-7 indicates these connections. Figure 7-37 is a schematic of such a cable.

> **NOTE:** Connecting the DTR and DSR lines together will cause the RS-232-C Interface to appear to be active. This will prevent access to the individual Serial screens while the cable is connected. Access can be gained to these screens by disconnecting the RS-232-C cable assembly from the 5300.

Table 7-7. RS-232-C Cable Wiring for Software Handshaking

5300 Pin	Name	Computer Pin	Name	Notes
7	SG	7	SG	Signal Ground
2	TD	3	RD	Data from 5300 to computer
3	RD	2	TD	Data from computer to 5300
6	DSR			Connect these two together
20	DTR			
1	FG	1	FG	Frame Ground, optional connection

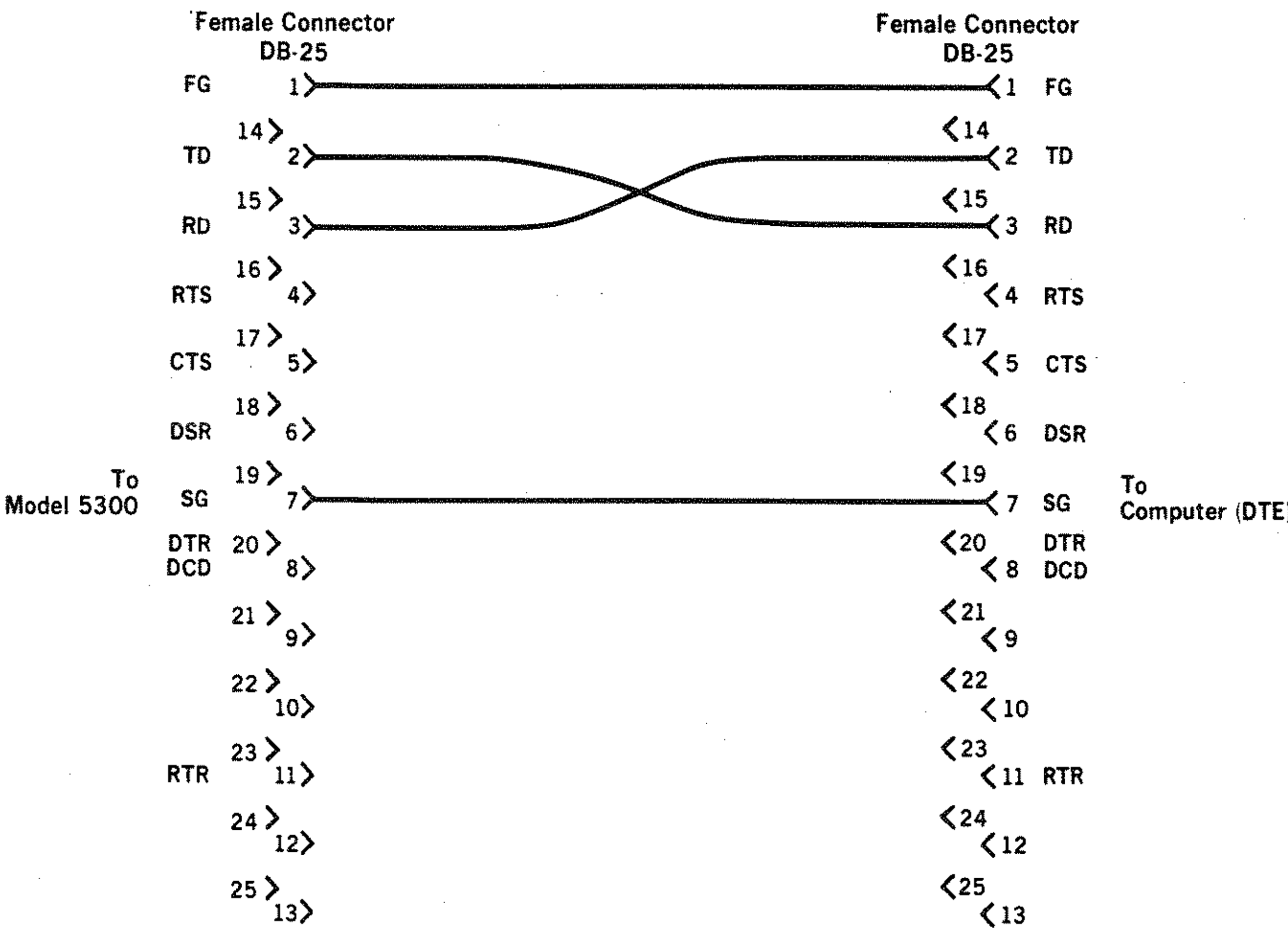


Figure 7-37. RS-232-C Cable Wiring for Software Handshaking

If hardware handshaking is selected, a different set of connections is required. Table 7-8 indicates these connections. Figure 7-38 is a schematic of such a cable.

Table 7-8. RS-232-C Cable Wiring for Hardware Handshaking

5300 Pin	Name	Computer Pin	Name	Notes
7	SG	7	SG	Signal Ground
2	TD	3	RD	Data from 5300 to computer
3	RD	2	TD	Data from computer to 5300
6	DSR	20	DTR	Allows each device to detect that
20	DTR	6	DSR	the other is active
4	RTS	8	DCD	Allows hardware handshaking
5	CTS	11	RTR	
8	DCD	4	RTS	
11	RTR	5	CTS	
1	FG	1	FG	Frame Ground, optional connection

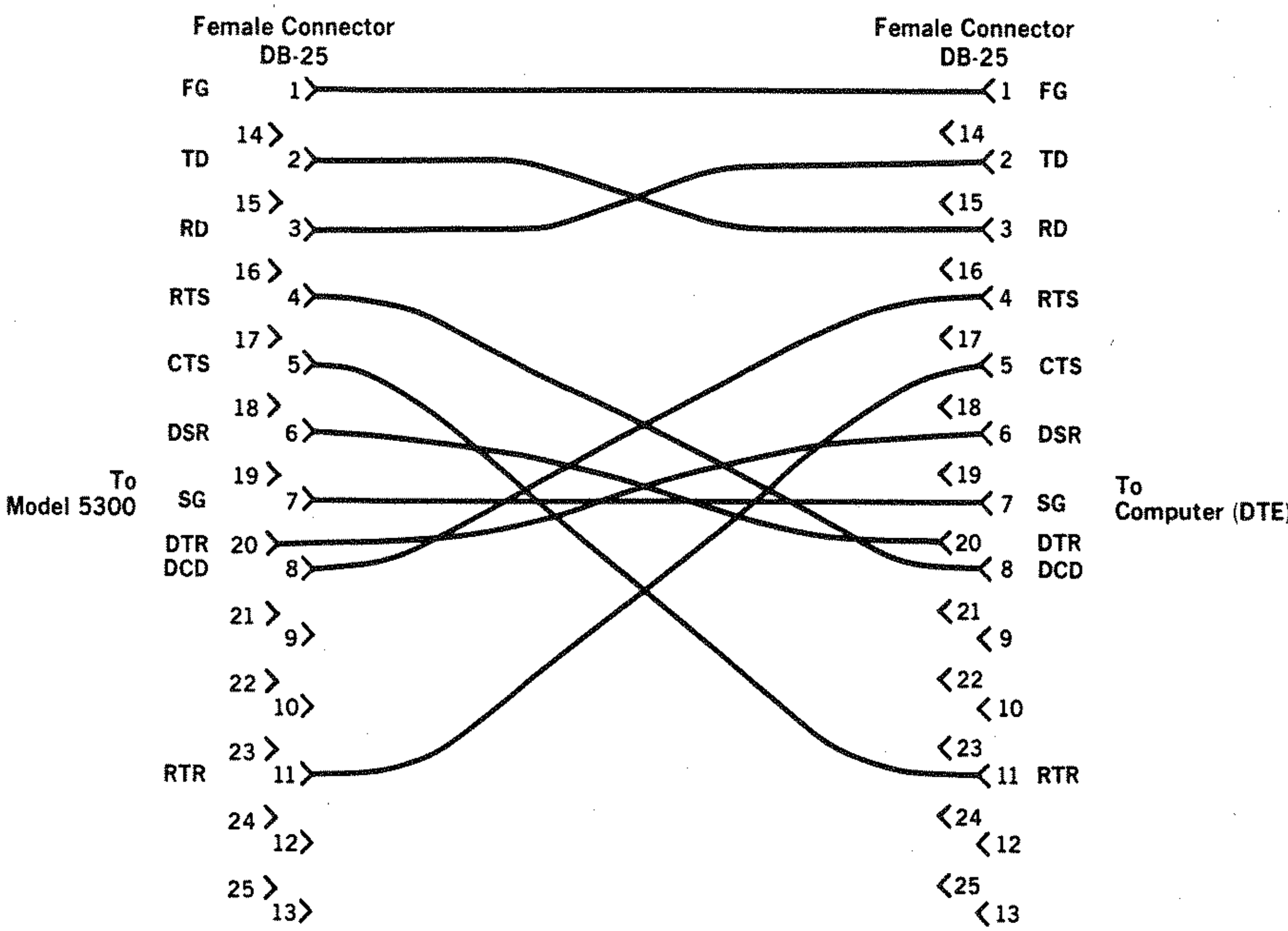


Figure 7-38. RS-232-C Cable Wiring for Hardware Handshaking

7.7.3 RS-449 Interface

The RS-449 Interface connector, a male DC-37 connector located on the rear of the interface, follows the EIA RS-449/422 standard. The electrical installation of this interface consists of constructing a cable to connect the interface to the (DTE) computer. Information regarding the construction of this cable is contained in this section.

The cable must have a female DC-37 connector at both ends. An Amphenol 17-80370-15 or equivalent should work properly.

Instrument configuration for use with RS-449/422 consists of setting several communication parameters. Refer to Serial, Section 3.7.2, for information on setting these parameters.

Before constructing the RS-449 cable, the type of handshaking (software or hardware) to be used must be determined. For information on selecting the type of handshaking, refer to Handshaking, Section 3.7.3.2.

If software handshaking is selected, the cable requires only five wires and four jumpers. Table 7-9 indicates these connections. Figure 7-39 is a schematic of such a cable.

The cable should consist of fully-shielded twisted wire pairs. Belden #9805 is acceptable when software handshaking is used. One of the twisted pairs should be used for the SG connection.

> **NOTE:** Connecting the TR and DM lines together will cause the RS-449 Interface to always appear to be active. This will prevent access to the individual Serial screens while the cable is connected. To gain access to these screens, the RS-449 cable should be disconnected.

Table 7-9. RS-449/422 Cable Wiring for Software Handshaking

5300 Pin	Name	Computer Pin	Name	Notes
19	SG	19	SG	Signal Ground
4	SD+	6	RD+	Data from 5300 to Computer
22	SD-	24	RD-	
6	RD+	4	SD+	Data from Computer to 5300
24	RD-	22	SD-	
11	DM+			Connect these two together
12	TR+			
29	DM-			Connect these two together
30	TR-			
7	RS+			Connect these two together
9	CS+			
25	RS-			Connect these two together
27	CS-			
13	RR+			Connect these two together
3	RTR+			
31	RR-			Connect these two together
21	RTR-			
1	SHIELD	1	SHIELD	Optional connection

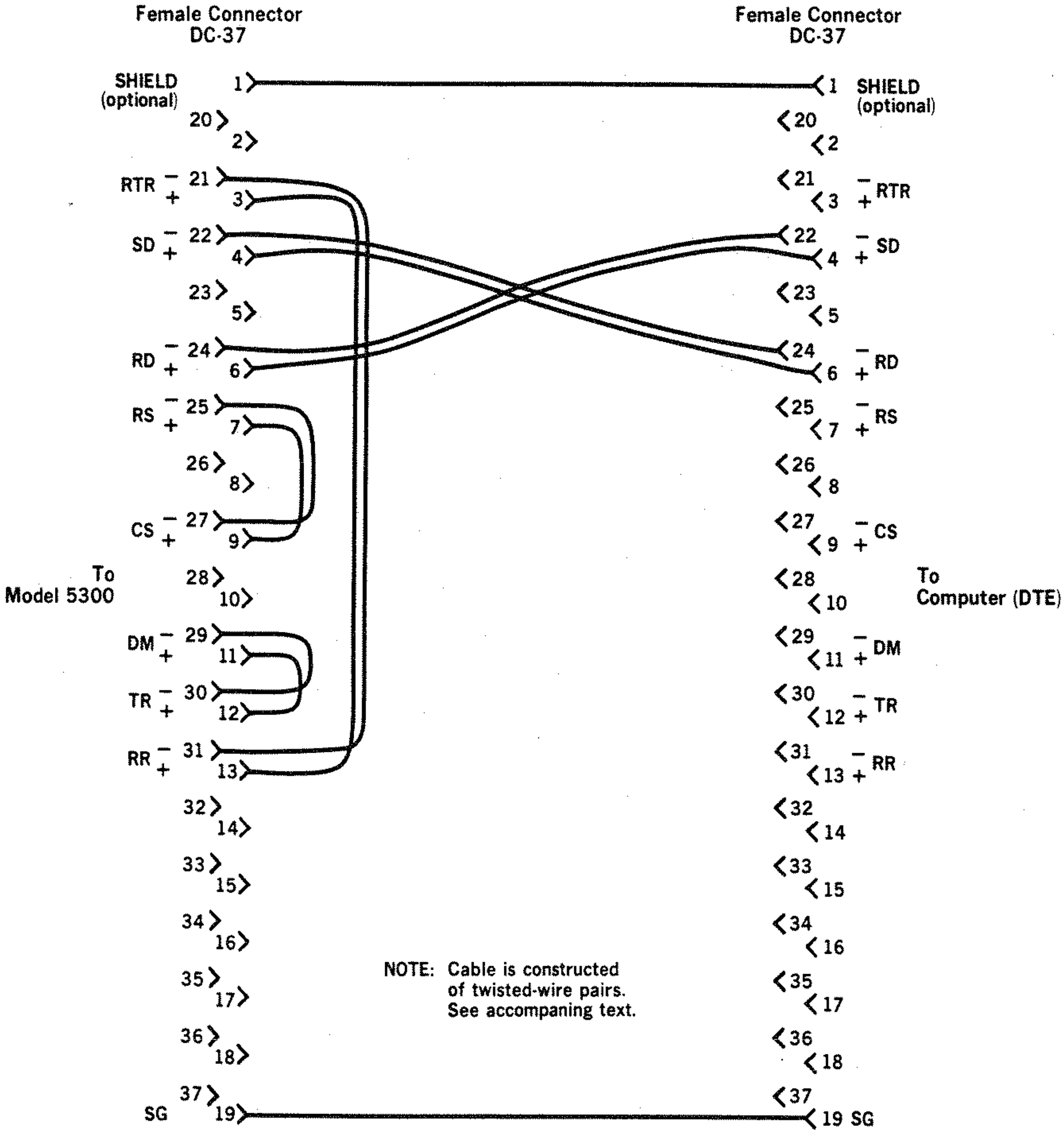


Figure 7-39. RS-449/422 Cable Wiring for Software Handshaking

If hardware handshaking is selected, a different set of connections is required. Table 7-10 indicates these connections. Figure 7-40 is a schematic of such a cable.

The cable should consist of fully-shielded twisted wire pairs. Belden #9809 is acceptable when hardware handshaking is used. One of the twisted pairs should be used for the SG connection.

Table 7-10. RS-449/422 Cable Wiring for Hardware Handshaking

5300 Pin	5300 Name	Computer Pin	Computer Name	Notes
19	SG	19	SG	Signal Ground
4	SD+	6	RD+	Data from 5300 to Computer
22	SD-	24	RD-	
6	RD+	4	SD+	Data from Computer to 5300
24	RD-	22	SD-	
11	DM+	12	TR+	Allows each device to detect that the other is active
29	DM-	30	TR-	
12	TR+	11	DM+	
30	TR-	29	DM-	
7	RS+	13	RR+	Allows hardware handshaking
25	RS-	31	RR-	
13	RR+	7	RS+	
31	RR-	25	RS-	
9	CS+	3	RTR+	
27	CS-	21	RTR-	
3	RTR+	9	CS+	
21	RTR-	27	CS-	
1	SHIELD	1	SHIELD	Optional connection

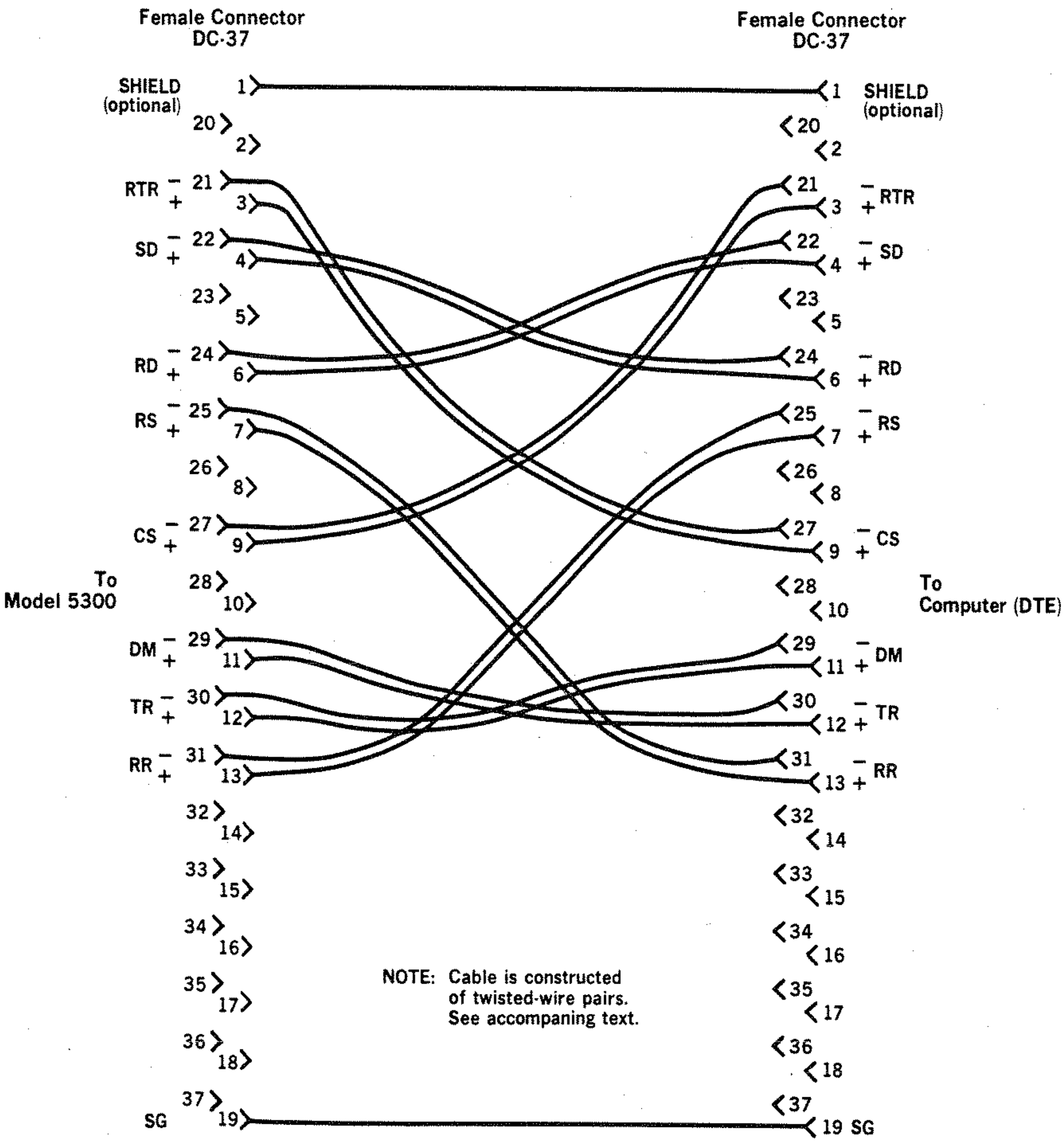


Figure 7-40. RS-449/422 Cable Wiring for Hardware Handshaking

7.8 PARALLEL PRINTER INTERFACE

Installation of the (Centronics-compatible) Parallel Printer Interface (P/N 61115) consists of a mechanical installation and cable connection. When the interface is to be used by the 5300, it must be selected at the Interface Select screen.

The mechanical installation of this interface is described in OPTIONAL INTERFACE MECHANICAL INSTALLATION, Section 7.5.

The connector on this interface is a female DB-25 type. The pin assignments are the same as those used on the IBM PC, allowing the same printer cable to be used. Table 7-11 provides the pin assignments for such a cable.

Table 7-11. Parallel Printer Interface Cable Pin Assignments

5300 Pin Number	Printer Pin Number	5300 Pin Number	Printer Pin Number
1	1	14	14 (Not Used)
2	2	15	32
3	3	16	31 (Not Used)
4	4	17	36 (Not Used)
5	5	18	33
6	6	19	19
7	7	20	21
8	8	21	23
9	9	22	25
10	10	23	27
11	11	24	29
12	12	25	30
13	13		

Refer to Interface Select Screen, Section 3.4.5.12.1 and Setting Printer Parameters, Section 7.9.2 for information on selecting this interface for output to a printer.

7.9 PRINTER CONNECTION

A printer may be connected to a serial interface, the GPIB Interface, or the Parallel Printer Interface. This connection consists of the following: installing the interface, connecting the interface to the printer, setting the communication parameters on the printer, and setting the communication parameters on the 5300. The following sections describe these procedures.

7.9.1 Mechanical Installation of the Printer

The mechanical installation of the printer consists of installing the appropriate interface in the 5300 and connecting the interface to the printer. Information regarding the installation of the GPIB Interface is contained in GPIB Interface, Section 7.7.1. The RS-232-C Interface is covered in RS-232-C Interface, Section 7.7.2. The RS-449 Interface is covered in RS-449 Interface, Section 7.7.3. The Parallel Printer Interface is covered in Parallel Printer Interface, Section 7.8.

7.9.2 Setting Printer Parameters

Once the mechanical installation is complete, the appropriate communication parameters must be set in the printer and in the 5300.

There are typically two groups of settings that can be selected in a printer: communication parameters and print characteristics. The communication parameters must be set for a printer that communicates by a serial or by a GPIB interface. These parameters should be set to the same values set in the 5300. For information on setting these values in the 5300, refer to GPIB Parameter Screens, Section 3.7.1.3 or Serial Parameter Screens, Section 3.7.2.3. An example of setting these parameters is found later in this section.

The print characteristics allow the selection of how the characters will appear on the page. Such items as perforation skip, page length, line spacing, character pitch, and automatic LF may be selectable in the printer. The following paragraphs discuss each of these selections.

The 5300 will print a continuous series of lines, with no blank lines inserted to skip page perforations. For this reason, it may be desirable to set the printer to automatically skip the perforations. The page length and line spacing should be set according to personal preference and the length of paper used.

The 5300 sends no more than 72 characters per line. The character pitch should be set to ensure that 72 characters will fit on one line.

Every line sent by the 5300 to the Parallel Printer interface will be terminated by a carriage return and a linefeed. The printer should be set to perform a linefeed only when the linefeed character is received. The use of output terminators for the serial and GPIB interfaces is selectable at the 5300.

The following is an example of setting up a serial printer. The communication parameters will be set to 4800 baud, 8 data bits, no parity, 1 stop bit, carriage return and linefeed used as output terminators, and XON/XOFF buffer control will be used.

STEP 1. Set the printer to support the conditions listed in Table 7-12. Refer to the printer's instruction manual.

Table 7-12. Serial Printer Parameters

Parameter	Setting
Baud Rate	4800
Data Bits	8
Parity	None
Stop Bits	1
Automatic Linefeed	Off
Buffer Control	XON/XOFF (Software)

STEP 2. Press the POWER pushbutton on the 5300 to turn the instrument to 1 (on). Refer to Figure 7-41.

STEP 3. Turn the access keyswitch to the SET position to gain access to the SET mode. The SET LED should illuminate. Refer to Figure 7-41.

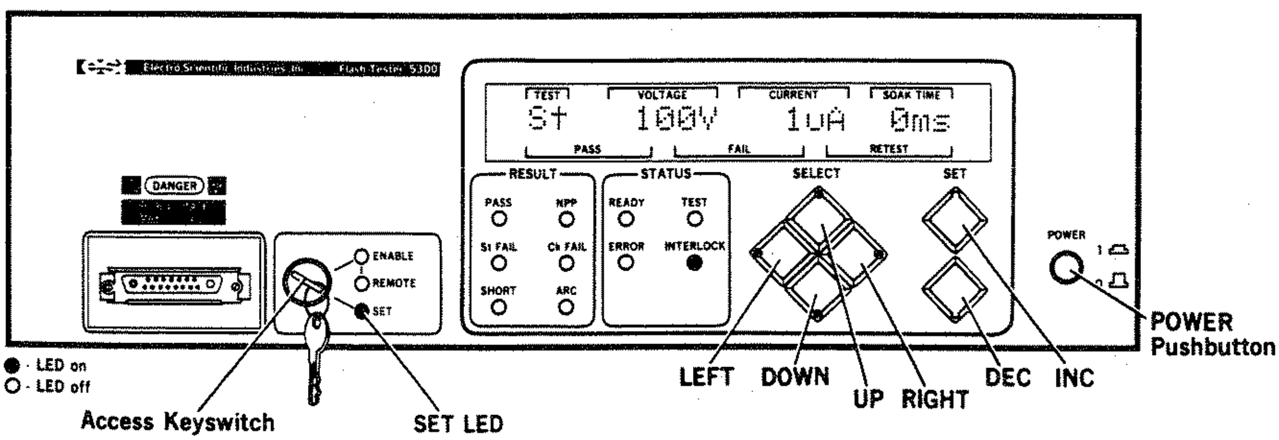


Figure 7-41. Front Panel

STEP 4. Press the UP or DOWN pushbutton until the Nominal Capacitance and Charge Rate screen is displayed. Figure 7-42 is an example of this screen.

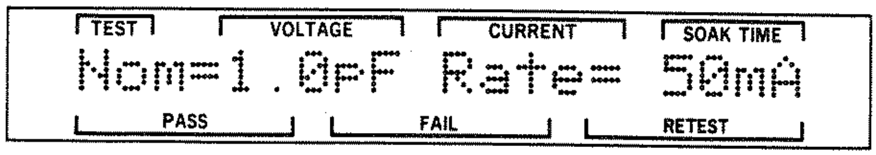


Figure 7-42. Nominal Capacitance and Charge Rate Screen

STEP 5. Press the INC and DEC pushbuttons simultaneously and release them. This should cause the 5300 to enter the Configure mode.

STEP 6. Press the UP or DOWN pushbutton until the Serial Interface Entry screen is displayed. Figure 7-43 is an illustration of this screen.

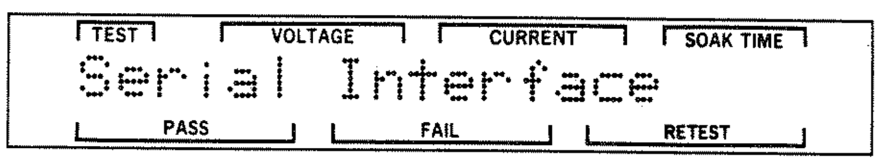


Figure 7-43. Serial Interface Entry Screen

STEP 7. Press the RIGHT pushbutton to access the individual Serial screens.

STEP 8. Press the UP or DOWN pushbutton until the Baud Rate screen is displayed. Figure 7-44 is an example of this screen.

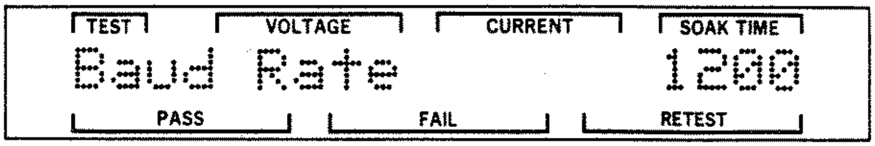


Figure 7-44. Baud Rate Screen

STEP 9. Press the INC or DEC pushbuttons to change the Baud Rate to 4800.

STEP 10. Press the DOWN pushbutton once to display the Character Size screen. Figure 7-45 is an example of this screen.

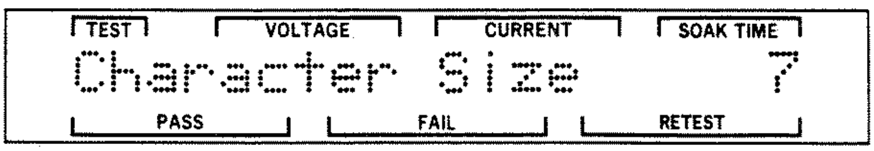


Figure 7-45. Character Size Screen

STEP 11. Press the INC or DEC pushbutton until 8 is displayed.

STEP 12. Press the DOWN pushbutton once to display the Parity screen. Figure 7-46 is an example of this screen.

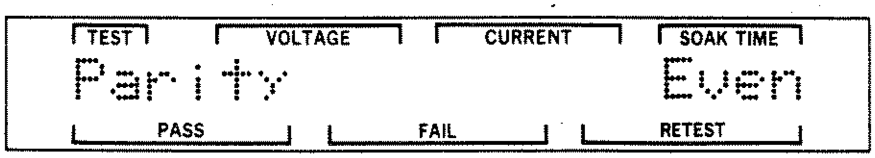


Figure 7-46. Parity Screen

STEP 13. Press the INC or DEC pushbutton until None is displayed.

STEP 14. Press the DOWN pushbutton once to display the Stop Bits screen. Figure 7-47 is an example of this screen.

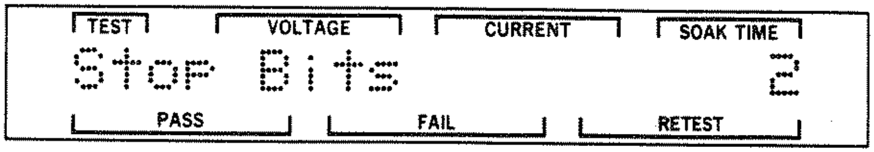


Figure 7-47. Stop Bits Screen

STEP 15. Press the INC or DEC pushbutton until 1 is displayed.

STEP 16. Press the DOWN pushbutton once to display the Output screen. Figure 7-48 is an example of this screen.

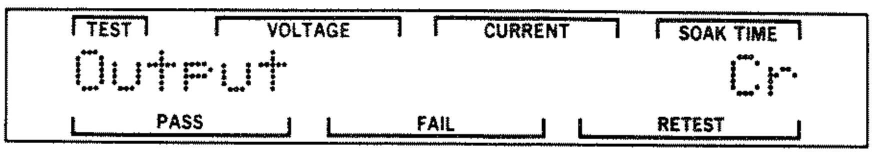


Figure 7-48. Output Screen

STEP 17. Press the INC or DEC pushbutton until CR + LF is displayed.

STEP 18. Press the DOWN pushbutton once to display the XON/XOFF screen. Figure 7-49 is an example of this screen.

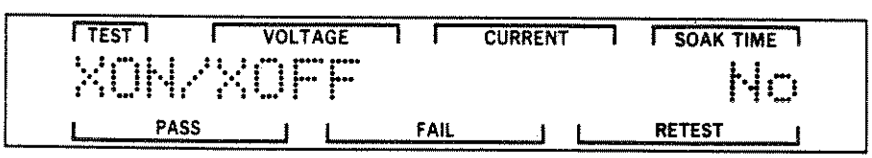


Figure 7-49. XON/XOFF Screen

STEP 19. Press the INC or DEC pushbutton until Yes is displayed.

STEP 20. Press the DOWN pushbutton once to display the Printer screen. Figure 7-50 is an example of this screen.

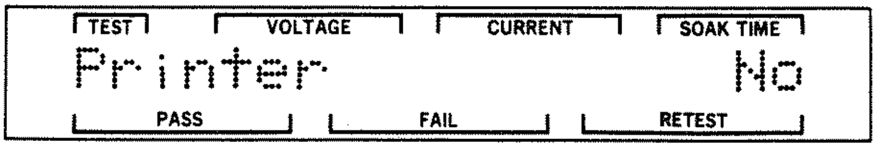


Figure 7-50. Printer Screen

STEP 21. Press the INC or DEC pushbutton until Yes is displayed.

STEP 22. Press the LEFT pushbutton to return to the Serial Entry screen.

STEP 23. Press the DOWN pushbutton twice to display the Printer Entry screen. Figure 7-51 is an illustration of this screen.

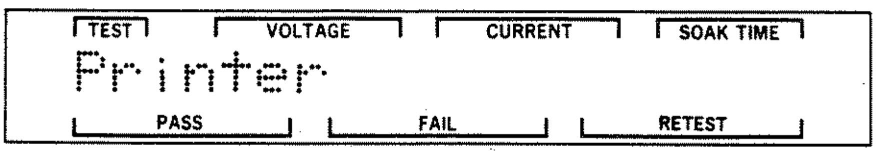


Figure 7-51. Printer Entry Screen

STEP 24. Press the RIGHT pushbutton to access the individual Printer screens.

STEP 25. Press the UP or DOWN pushbutton until the Interface Select screen is displayed. Figure 7-52 is an example of this screen.

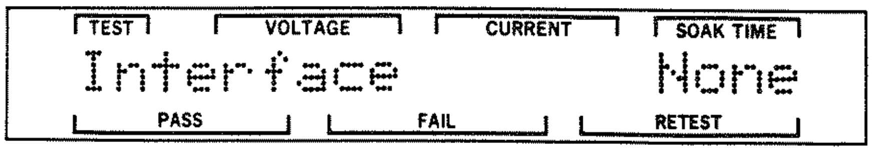


Figure 7-52. Interface Select Screen

STEP 26. Press the INC or DEC pushbutton until Serial is displayed.

STEP 27. Turn the access keyswitch to the ENABLE position to return to the ENABLE mode.

STEP 28. Press the UP or DOWN pushbutton until the Printed Reports Entry screen is displayed. Figure 7-53 is an illustration of this screen.

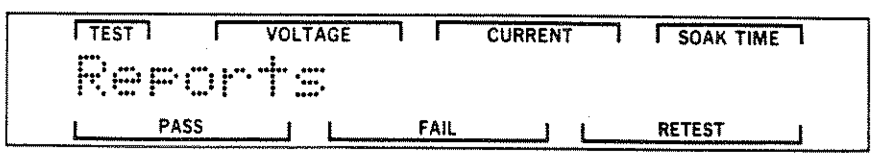


Figure 7-53. Printed Reports Entry Screen

STEP 29. Press the RIGHT pushbutton to access the individual Printed Reports screens. Press the UP or DOWN pushbutton until the Print Header screen is displayed. Figure 7-54 is an illustration of this screen.

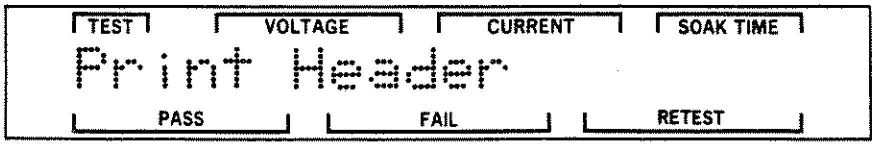


Figure 7-54. Print Header Screen

STEP 30. Press the RIGHT pushbutton to instruct the 5300 to print the header. Figure 7-55 is an example of a header printout.

```
Electro Scientific Industries Inc., Model 5300, Version 3A
Test    Test Voltage     Test Current     Soak Time      Calculated Rate
St      100V             20uA             0ms            50mA
Ck      50V              5uA              0ms            50mA
Nominal C= 1.0nF         Charge Rate= 50mA
Max V= 1250V             Presence Cal= 16      Output Every Nth= 1000
St Stray Cal= 270pF      Ck Stray Cal= 470pF   HV Clamp Cal= 250
```

Figure 7-55. Print Header Output

STEP 31. Press the LEFT pushbutton once to return to the Printed Reports output screen. This procedure is complete.

7.10 INITIAL CHECKOUT

Once the installation has been completed, the initial checkout should be performed to verify that the instrument is functioning properly. The following is a description of an initial checkout procedure.

WARNING

THE FOLLOWING PROCEDURE SHOULD NOT BE PERFORMED UNLESS THE INTERLOCK SYSTEM HAS BEEN PROPERLY INSTALLED AND TESTED. FAILURE TO DO SO CAN EXPOSE THE USER TO POTENTIALLY LETHAL HIGH VOLTAGE. CONTACT WITH THIS HIGH VOLTAGE CAN CAUSE SERIOUS INJURY AND/OR DEATH. REFER TO TESTING THE INTERLOCK CONNECTION, SECTION 7.4.4.3, FOR INFORMATION ON VERIFYING PROPER OPERATION OF THE INTERLOCK SYSTEM.

STEP 1. Verify that the line voltage has been properly set and that the proper fuse is installed. Refer to LINE POWER CONNECTION, Section 7.2.

STEP 2. Verify that the interlock system has been properly tested. Refer to Testing the Interlock Connection, Section 7.4.4.3.

STEP 3. Place a known good DUT in the standard test position under the test head. The capacitance of this DUT should be greater than 100 picofarads. If a DUT of smaller capacitance value must be used, the Presence calibration must be performed. Refer to Presence Calibration, Section 5.2.3.

STEP 4. Press the POWER pushbutton to turn the 5300 to 1 (on). Wait for the self-test to complete, as indicated by the READY or INTERLOCK LED illuminating. Refer to Figure 7-56.

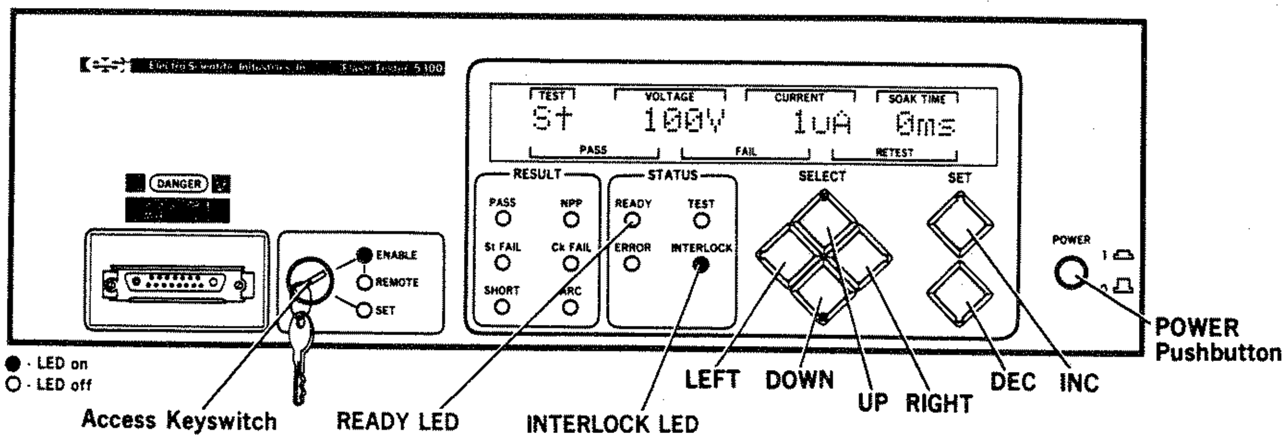


Figure 7-56. Front Panel

STEP 5. The test conditions must be reset through the use of the Test Conditions Reset screen. Turn the access keyswitch to the SET position. Refer to Figure 7-56.

STEP 6. Press the UP or DOWN pushbutton until the Nominal Capacitance and Charge Rate screen is displayed. Figure 7-57 is an example of this screen.

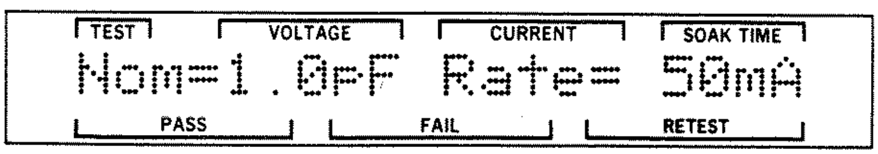


Figure 7-57. Nominal Capacitance and Charge Rate Screen

STEP 7. Press the INC and DEC pushbuttons simultaneously, then release them. The display will change to indicate that the Configure mode has been entered.

STEP 8. Press the UP or DOWN pushbutton until the Reset Entry screen is displayed. Figure 7-58 is an illustration of this screen.

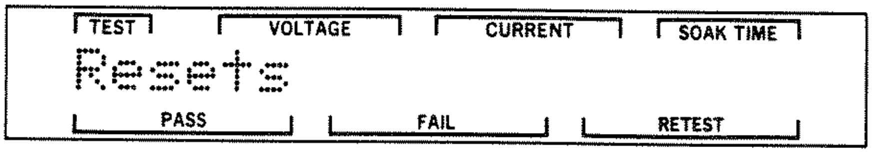


Figure 7-58. Reset Entry Screen

STEP 9. Press the RIGHT pushbutton to access the individual Reset screens. Press the UP or DOWN pushbutton until the Test Conditions Reset screen is displayed. Figure 7-59 is an illustration of this screen.

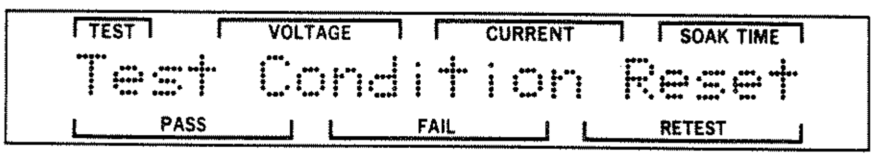


Figure 7-59. Test Conditions Reset Screen

STEP 10. Press the RIGHT pushbutton to perform a Test Condition reset.

STEP 11. Press the LEFT pushbutton twice to return to the Nominal Capacitance and Charge Rate screen in the Set mode.

STEP 12. Press the RIGHT pushbutton once to allow the Nominal Capacitance to be changed. Figure 7-60 is an example of this screen.

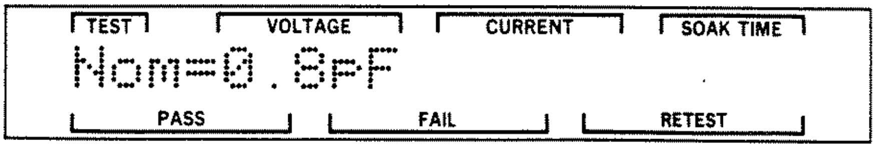


Figure 7-60. Nominal Capacitance Screen

STEP 13. Press the INC or DEC pushbutton until the displayed Nominal Capacitance is the same as (or as close as possible) that of the DUT. Press the LEFT pushbutton to return to the Nominal Capacitance and Charge Rate screen.

STEP 14. Press the UP pushbutton once to display the Check Test Conditions screen. Refer to Figure 7-61.

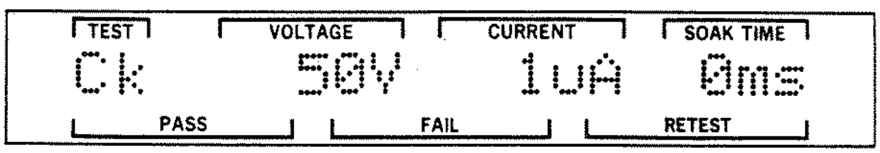


Figure 7-61. Check Test Conditions Screen

STEP 15. Press the RIGHT pushbutton twice to allow the Check Leakage Current to be set. Refer to Figure 7-62 for an illustration of this screen.

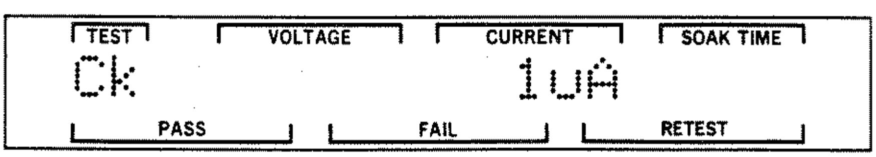


Figure 7-62. Check Leakage Current Screen

STEP 16. Press the INC pushbutton until 5 uA is displayed.

STEP 17. Press the LEFT pushbutton twice to return to the Check Test Conditions screen. Press the UP pushbutton once to display the Stress Test Conditions. Figure 7-63 is an illustration of this screen.

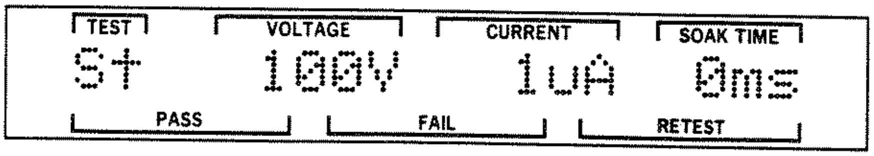


Figure 7-63. Stress Test Conditions Screen

STEP 18. Press the RIGHT pushbutton twice to allow the Stress Leakage Current to be set. Refer to Figure 7-64 for an illustration of this screen.

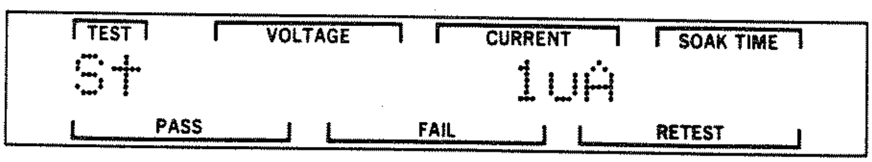


Figure 7-64. Stress Leakage Current Screen

STEP 19. Press the INC pushbutton until 10 uA is displayed.

STEP 20. Press the LEFT pushbutton twice to return to the Stress Test Conditions screen. Turn the access keyswitch to the ENABLE position to allow a normal test to be performed.

STEP 21. Verify that the interlock is closed by observing the INTERLOCK and READY LEDs on the 5300. The READY LED should be illuminated; the INTERLOCK LED should not. Refer to Figure 7-65 for the locations of these LEDs.

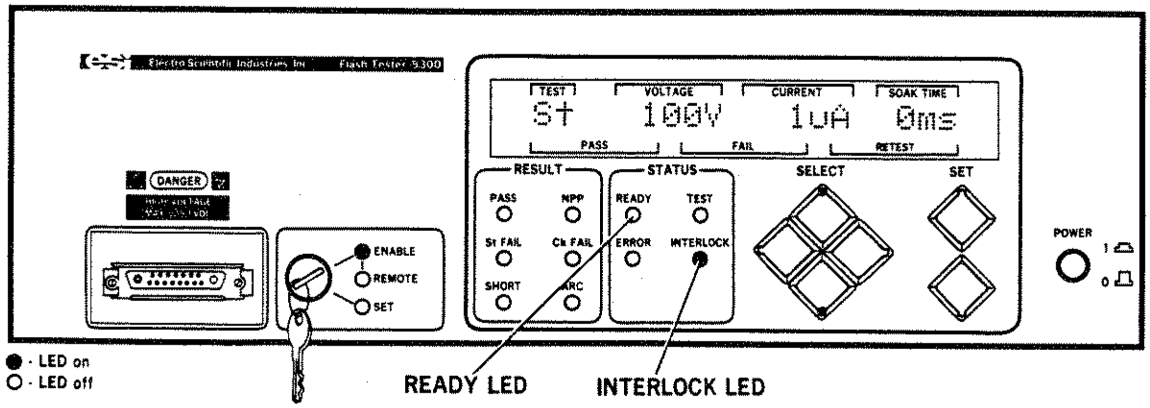


Figure 7-65. READY and INTERLOCK LEDs

STEP 22. Initiate a test through the Test connector, through the Handler Interface, or through a communication interface. For information on initiating a test, refer to Start Switch Installation, Section 7.4.3.2, (Handler Interface) Control Inputs, Section 3.6.2.2, or PROGRAMMING, Section 3.8.

STEP 23. The READY LED should turn off and the TEST LED should briefly illuminate to indicate a test taking place. When the test is complete, the READY LED will be illuminated, as will one RESULT LED. Refer to Figure 7-66 for the location of the RESULT LEDs.

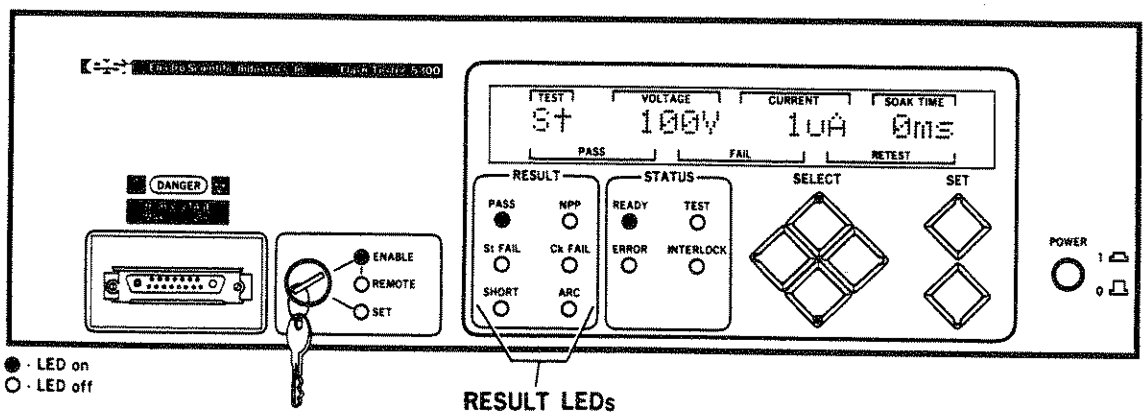


Figure 7-66. RESULT LEDs

STEP 24. If the PASS LED is illuminated, this portion of the Initial Checkout is complete. Proceed to step 31.

STEP 25. If any RESULT LED other than the PASS LED is illuminated, repeat the preceding test with a different DUT.

STEP 26. If the NPP LED is illuminated, verify that there is proper probe-to-DUT contact, that the Test cable does not have any breaks, and that the DUT is good. If none of these is the problem, perform a Presence calibration (refer to Presence Calibration, Section 5.2.3) and repeat this test.

STEP 27. If the St FAIL LED is illuminated, verify that the correct Nominal Capacitance was set. The test should be repeated with a higher value for Stress Leakage Current or Stress Soak Time until a PASS result is received.

STEP 28. If the Ck FAIL LED is illuminated, repeat the test with a higher value for Check Leakage Current or Check Soak Time until a PASS result is received.

STEP 29. If the SHORT LED is illuminated, remove the DUT and perform a test without the DUT. If the SHORT LED illuminates, there is a short between the HV Output and Sense Input lines. If the NPP LED illuminates, the DUT was shorted. Repeat the original test with a different DUT.

STEP 30. If the ARC LED is illuminated, the problem is likely to be in the DUT. Repeat the with a different DUT, verifying that the Stress and Check Voltages are not too high for the DUT.

STEP 31. Remove the DUT and initiate a test. At the end of the test, the NPP LED should be illuminated. If this is not the case, perform the Presence calibration (refer to Presence Calibration, Section 5.2.3) and repeat this test.

STEP 32. Connect a wire between the two probes and conduct another test. The SHORT LED should illuminate.

STEP 33. This portion of the Initial Checkout is complete. Perform a Presence calibration (refer to Presence Calibration, Section 5.2.3), follow the procedures in PERFORMANCE TEST, Section 5-1, and obtain a printout of the system configuration (refer to Print Configuration Screen, Section 3.4.5.12.2). If a printer is not attached, scroll through the screens, recording all of the information normally found in the system configuration printout. This information will allow the system configuration to be manually restored in the case of an accidental Installation or Global Reset.

SECTION 8
PARTS LISTS AND DIAGRAMS

8.1 FINAL ASSEMBLY (P/N 55300)

CIRCUIT NO.	DESCRIPTION	ESI PART NO.
	Circuit Assembly, CPU	57709
	Circuit Assembly, High Voltage	59038
	Circuit Assembly, Low Voltage	59036
	Circuit Assembly, Display	59241
	Circuit Assembly, Test Point Board	59608
	Circuit Assembly, Fuse Board	59128
	Circuit Assembly, Digital Bus	59670
	Assembly, Vacuum Fluorescent Display	60354
	Kit, Accessories	59644
	Cable Assembly, High Voltage	60301
	Cable Assembly, Digital Bus	60303
	Cable Assembly, Display Board To Display	60304
	Harness Assembly, Internal Test	60296
	Harness Assembly, 5/15 volt	60298
	Assembly, Keylock	60302
	Transformer	59627
C1	Capacitor, 22,000 microfarad, 16 volt DC, Electrolytic	59615
C2,C3	Capacitor, 1 microfarad, 50 volt, 20% (part of P/N 60298)	43852
	Full-Wave Bridge Rectifier, 4 kilovolt, 0.65 ampere	60171
	Power Entry Module	60502
	IC, EPROM, 512 kilobit, Programmed	61596
U16	IC, LM323, 3 ampere, +5 volt Regulator	24010
	Insulator, TO-3	43176
	Fuse, 3AG, 1.5 ampere, Slow Blow	27152
	Fuse Holder, Metric	57011
	Power Switch Push Rod	59617

8.1 FINAL ASSEMBLY (P/N 55300) (Continued)

CIRCUIT NO.	DESCRIPTION	ESI PART NO.
	Window, Display	60631
	Filter, Display	61179
	Frame, Display Window	60741
	Assembly, Fan	60297
	Fan Filter	46932
	Cover, Fan Filter, Square	60412
	Cover, Strip	42415
	Front Panel	59390
	Rear Panel	59391
	Side, Cabinet, Right	59392
	Side, Cabinet, Left	59393
	Panel, Side, Right	59395
	Panel, Side, Left	59396
	Top Cover	59625
	Bottom Cover	59624
	High Voltage Exit Cover	59633
	High Voltage Output Bracket	59635
	Foot, Adhesive	58270
	Bail, 12 inch long	24007
	Bezel	41263
	Bracket, Fan Filter Mount	59784
	Bridge Rectifier Plate	59628
	Capacitor Clamp	13434
	Card Cage Rail, Center	59394
	Card Cage Wrap	59397
	Cover Plate, Digital Card Cage	59616
	Finger Guard	46289