

Series 2040D Test Systems

**2040D**  
**Maintenance**  
**Manual**

**Part Number #4200-0181**  
**Version 1.0**

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# *System Overview*



## SYSTEM MAINTENANCE OVERVIEW

The Series 2040 Test System has been designed with extensive diagnostics and self testing capabilities. Each module and circuit board includes additional circuitry for calibration and self testing programs. In addition, a Selftest Assembly is provided to calibrate and functionally test every component in the test system. This assembly attaches to the fixture interface to provide the best accuracy and reliability for calibration and self-diagnostics.

The Certification program uses a Calibration station containing a Digital Voltmeter (DVM) and Universal Counter/Timer, which are certified by the National Institute of Standards and Technology as a "Transfer Standard," to calibrate the internal precision references of the tester. The Selftest Assembly uses a 18-bit D/A converter (TDAC) as an internal precision voltage standard. The internal precision time standard is a Temperature Compensated Crystal Oscillator located on the Time Measurement System board.

The Calibration and Selftest routines calibrate the remainder of the system to the tester's internal precision references. Calibration constants are derived during Calibration. These constants are used during runtime to maintain system accuracy. The Calibration constants are stored on the hard drive and reloaded at powerup. Complete system auto-calibration is achieved without any pots to adjust.

The Selftest programs use the Selftest Assembly to test all circuits to their published specifications, and assure that all paths and modules are functional. The System Maintenance guide is written for troubleshooting to the module and circuit board level.



**The tester shall be disconnected from all power sources before it is opened for any adjustment, replacement, maintenance or repair. If service repairs performed under power become necessary, the repairs shall be performed by a skilled technician who is aware of the hazard involved.**



# *Selftest & Calibration*



## SELFTEST AND CALIBRATION OVERVIEW

Calibration on the Series 2040 Functional Test System is completely automated. All calibration is based on high precision references built into the system Testhead and the Selftest Assembly. A high precision Temperature Compensated Crystal Oscillator (TCXO) on the Time Measurement System Board (TMS) is used as a frequency/time reference. A precision digital to analog converter (TDAC) contained within the Selftest Assembly is used as a voltage reference for system calibration.

### Purpose Of Calibration

Calibration of the functional tester is necessary to obtain gain and offset terms for all signal paths that exist within the system, and to determine timing for the MDE's (Measurement Display Electronics) sweeps, delays, triggers, and measurement mark. Since potentiometers are used in only a few instances where factory calibration is required, the majority of the calibration is done by taking measurements and calculating calibration terms which can be referenced at a later time. These terms are used by the hardware functional calls to account for gains, offsets, and timing discrepancies, and their use is transparent to the user.

In all calibration programs, limits are set on what values any given calibration term may take on. If a calculated value is outside of the allowable range, a failure will result and be displayed/printed to the designated output device .

### When To Calibrate

Selftest is the best guide to determine if calibration is required. The battery of Selftest programs is designed to test all functions of the 2040 to their specifications. If any failures occur during Selftest (especially borderline failures), calibration should be carried out before proceeding to troubleshoot the system.

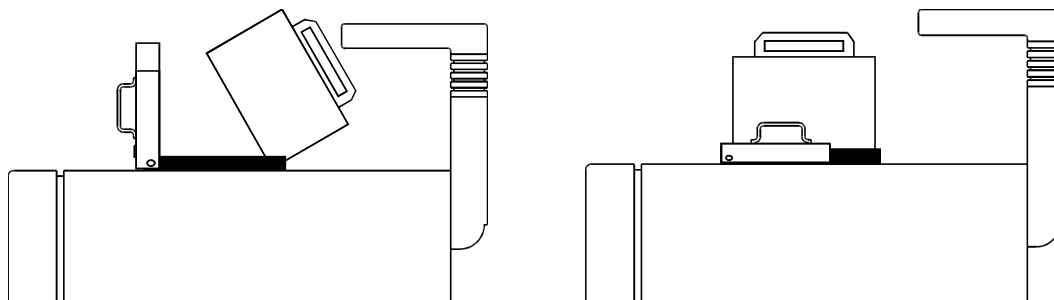
Running through Selftest periodically can tell you if calibration is or is not required. If you find that all Selftest programs run without failures, there is no need to recalibrate any portion of the tester. The recommended guideline is to calibrate every 3 months.

Whenever a temperature change of more than five (5) degrees Celsius occurs or a Testhead board swap is made, the 2040 should be recalibrated.

## SELFTEST

Selftest on the Series 2040 Test System is an automated procedure. The programs that comprise Selftest are organized under the Selftest Executive in a test menu called "Functional". These programs exercise the hardware functions available to the user through the hardware functional calls. To perform Selftest, proceed as follows:

- 1) Install the Selftest unit on the Patchboard assembly as shown below:



- A) Pull the locking handle towards the front of the unit until it is vertical.
  - B) Slide the pins on the rear of the Selftest unit into the Patchboard and rotate the Selftest unit forward until it is vertical, and sets into the Patchboard.
  - C) The ribbon assembly should be installed in the receptacle behind the Selftest, with the colored edge of the ribbon on the left side, while viewing the front of the unit.
  - D) Rotate the locking handle back to it's original position to lock the Selftest into place.
- 2) Enter the Selftest Executive by selecting (double-clicking on) the "SelfExec" program from the Windows Explorer. The Selftest Executive menu will be displayed as shown on the next page.
  - 3) From the File menu, select Configure, and the small "Report

EXECUTIVE (RUN-TIME)

File Help

1 10 100 1 Continuous  
1 Stop

Configuration Summary  
File: No Data  
Window: Fail Data  
Printer: No Data  
Log: Not Selected

Test Summary  
Cycle:  
Menu:  
Program:  
Total Fails:

1	calibrate	21	41	61	81
2	functional	22	42	62	82
3	factorycal	23	43	63	83
4		24	44	64	84
5		25	45	65	85
6		26	46	66	86
7		27	47	67	87
8		28	48	68	88
9		29	49	69	89
10		30	50	70	90
11		31	51	71	91
12		32	52	72	92
13		33	53	73	93
14		34	54	74	94
15		35	55	75	95
16		36	56	76	96
17		37	57	77	97
18		38	58	78	98
19		39	59	79	99
20		40	60	80	100

Utilities" dialog box in shown on the next page will appear. This box contains three separate ways of reporting the data collected during the tests. Data may be stored to a file, displayed on the screen and/or printed.

In addition, each of these three reporting functions can report "All Data", "Fail Data" or "No Data". "All Data" includes all of the pass or fail sequences from the test. "Fail Data" includes only information on the tests that failed. "No Data" disables that reporting function. To select, merely use the mouse to check or uncheck each reporting function. If a reporting device is unchecked, the options under that device appear "ghosted", indicating that they are disabled. For diagnostic purposes, enable the "Printer" and "File" options, and select the "Fail Data" option. Under the "File" section, click the "Diagnostic File" check box. Disable the Window reporting functions.

Report Utilities

File Options  
 Fail Data  
 All Data  
 No Data  
 Log Summary  
 Footer Only  
 Diagnostic File

Window Options  
 Fail Data  
 All Data  
 No Data  
 Log Summary

Printer Options  
 Fail Data  
 All Data  
 No Data  
 Log Summary  
 Footer Only

OK Cancel

- 4) Once the type(s) of reporting is completed, click on “OK” to return to the Selftest Executive menu. Select “Functional” from the Selftest Executive screen, and the Functional menu will appear as shown below.

1	self_dig_f	21	arb_mem_f	41	tms_dig_f	61	ocio_dig_f	81
2	th_config_tst	22	arb_brst_f	42	tms_evnt_f	62	ocio_f	82
3	ams_dig_f	23	arb_ext_f	43	tms_test_f	63	ocio_rail_f	83
4	ams_mods_f	24	arb_freq_f	44		64		84
5	ams_sig3_f	25	arb_mon_f	45	dio_f	65	adio_f	85
6		26	arb_ref_f	46	dio_ext_f	66	adio_ext_f	86
7	arly_dig_f	27	da_ref_f	47		67	ams_int_f	87
8	arly_f	28		48	iamp_dig_f	68		88
9	afet_rft_f	29		49	inst_f	69		89
10		30	mde_dlld_f	50	amp_cmrr_f	70		90
11	mrlly_dig_f	31	mde_dltm_f	51	isoamp_f	71		91
12	mrlly_f	32	mde_expm_f	52		72		92
13		33	mde_freq_f	53	pwr_mon_f	73		93
14	rmux_dig_f	34	mde_mrkp_f	54	ptest_f	74		94
15	rmux_f	35	mde_msmk_f	55	th_iso_f	75		95
16	rmux_prt_f	36	mde_pmes_f	56		76		96
17		37	mde_tgfl_f	57	msp_ser_f	77		97
18		38	mde_tglv_f	58		78		98
19		39		59		79		99
20		40		60		80		100

The Functional test menu has been organized so that tests closely related are blocked together in groups. If only one test is to be run, use the mouse to select that particular test. If a related group of tests is to be run, they may be selected using only the mouse. For example, if the Measurement Display Electronics group is to be selected, place the mouse pointer on test #30 and hold the left button down, and drag the mouse down to test #38. The entire MDE group is now selected. If a random series of tests is desired, place the mouse pointer on the box under “Run sequence”. When the Windows text tool appears, click the left mouse button. At the blinking cursor, any sequence of tests can be entered. The test numbers, however, must follow this syntax:

‘E’ (Execute) signifies the beginning of a sequence or acts as a separator between sequences.

“:” (Colon) signifies that the following number indicates the amount of iterations to perform of the previous sequence.

‘,’ (Comma) shares the definition of ‘E’ as a separator between sequences.

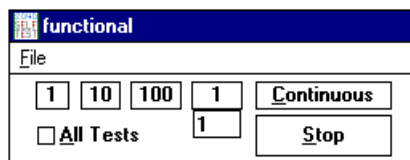
‘-’ (Dash) signifies inclusive or ‘through’.

**EXAMPLE: E1-3:5,6-100:2,1-5**

This sequence executes tests 1 through 3 five times, tests 6 through 100 two times, and tests 1 through 5 once.

If a single test or a group of selected tests is to be run once, 10 times, or 100 times, use the mouse to select the appropriate button on the upper left. If the test or group is to be run at some other number, place the mouse pointer in the box to the direct left of the stop button, and the Windows text tool will appear in place of the mouse pointer. Click the left mouse button while texttool is displayed in the box, and a blinking cursor appears in the box. The user can now enter any number from 1 to 999 for the number of times a test should run.

For diagnostic purposes, click the mouse button on the small box in the upper left corner of the menu next to “All Tests”. Select the “1” button, and the program will run all of the functional tests once, while reporting the data to wherever it was directed from the “Report Utilities” box. For diagnostics this path should include the “File” and “Printer” categories, and the “Fail Data” and “Diagnostic File” options.



- 5) If any of the Functional programs fail, check these common problems:

SELFTTEST ASSEMBLY IMPROPERLY INSTALLED - Check to make sure the assembly is properly installed on the Patchboard. Also,

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check the Selftest assembly's cable for damage.

UUT POWER SUPPLIES OFF - Make sure the UUT Power Supplies are on.

TESTHEAD POWER SUPPLY FAULT - Check the Testhead Power Supply Controller's indicator LEDs. If any of the LEDs are not lit, reset the system and recheck.

MISALIGNED PINS ON PATCHBOARD RECEIVER - Remove the Selftest Assembly and carefully inspect the alignment of the Patchboard receiver pins. Adjust any pins that are misaligned, remount the Selftest Assembly, and re-test.

After the common problems have been eliminated, a failure in Functional Selftest can indicate a hardware problem. Since a failure in Functional Selftest could also be caused by calibration, recalibrate the unit and run Functional Selftest again. If calibration or Functional Selftest fails now, a hardware problem most likely exists. Refer to the Selftest Failure Analysis on the next two pages.

**Selftest Failure Analysis**

	<b>Test Name</b>	<b>#1</b>	<b>#2</b>	<b>#3</b>
1)	SELF_dig-f	Selftest	TH Cont/CPU	TH P/S Cont
2)	th_config_tst	Testhead configuration does not match the stored configuration.		
3)	ams_dig_f	AMS	TH Cont/CPU	TH P/S Cont
4)	ams_mode_f	AMS	MSP/ISO	ASB
5)	ams_sig3_f	AMS	MSP/ISO	TH P/S Cont
6)				
7)	arly_dig_f	Arly/AFET	TH Cont/CPU	TH P/S Cont
8)	arly_f	Arly/AFET	RMUX	AMS
9)	afet_rft_f	AFET	RMUX	AMS
10)				
11)	mrly_dig_f	MRLY	Selftest	TH Cont/CPU
12)	mrly_f	MRLY	RMUX	AMS
13)				
14)	rmux_dig_f	RMUX	TH Cont/CPU	TH P/S Cont
15)	rmux_f	RMUX	AMS	Selftest
16)	rmux_prt_f	RMUX	AMS	MDE
17)				
18)				
19)				
20)				
21)	arb_mem_f	ASB	TH Cont/CPU	TH P/S Cont
22)	arb_brst_f	ASB	AMS	MDE
23)	arb_ext_f	ASB	AMS	MDE
24)	arb_freq_f	ASB	AMS	MDE
25)	arb_mon_f	ASB	AMS	MSP/ISO
26)	arb_ref_f	ASB	AMS	MDE
27)	da_ref_f	ASB	AMS	MSP/ISO
28)				
29)				
30)	mde_dlmd_f	MDE	TMS	AMS
31)	mde_dltm_f	MDE	TMS	AMS
32)	mde_expm_f	MDE	TMS	AMS
33)	mde_freq_f	MDE	TMS	AMS
34)	mde_mrkp_f	MDE	TMS	AMS
35)	mde_msmk_f	MDE	TMS	AMS
36)	mde_pmes_f	MDE	TMS	AMS
37)	mde_tgfl_f	AMS	MDE	TMS
38)	mde_tglv_f	AMS	MDE	TMS
39)				
40)				
41)	tms_dig_f	TMS	TH Cont/CPU	TH P/S Cont
42)	tms_evt_f	TMS	MDE	AMS
43)	tms_test_f	TMS	MDE	TH P/S Cont
44)				
45)	dio_f	DIO	Selftest	TH P/S Cont

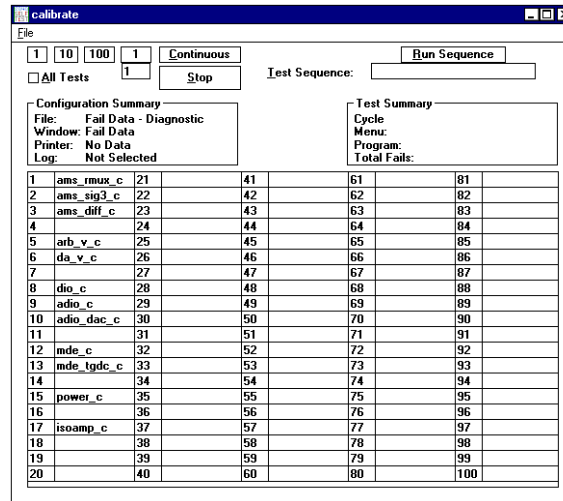
46)	dio_ext_f	DIO	Selftest	TH P/S Cont
47)				
48)	iamp_dig_f	INST	TH Cont/CPU	TH P/S Cont
49)	inst_f	INST	ASB	AMS
50)	amp_cmrr_f	INST	RMUX	AMS
51)	isoamp_f	MSP/ISO	ASB	AMS
52)				
53)	pwr_mon_f	Power Supply	TH P/S Cont	MSP/ISO
54)	ptest_f	UUT Controller	AMS/RMUX	Selftest
55)	th_iso_f	Scope Connected?	Internal coax short?	
56)				
57)	msp_ser_f	MSP	TH Cont/CPU	TH P/S Cont
58)				
59)				
60)				
61)	ocio_dig_f	OCIO	TH Cont/CPU	TH P/S Cont
62)	ocio_f	OCIO	Selftest	TH Cont/CPU
63)	ocio_rail_f	OCIO	Selftest	TH Cont/CPU
64)				
65)	adio_f	ADIO	Selftest	TH Cont/CPU
66)	adio_ext_f	ADIO	Selftest	TH Cont/CPU
67)	ams_int_f	AMS	MDE	TH Cont/CPU
68)				
69)	dms_dig_f	DMS	Selftest	TH Cont/CPU
70)	dms_mem_f	DMS	TH Cont/CPU	TH P/S Cont
71)				
72)	psc_dig_f	PSC	Any other Trigger Matrix board.	



## CALIBRATION

Whenever a Testhead board is replaced, or any time that Selftest determines a failure, a calibration must be performed. If a unit passes the complete Functional Selftest routine, a calibration is not necessary. When Calibrate is selected from the Selftest Executive, the screen shown to the right is displayed.

The Calibrate menu operates under the same basic rules as the Functional menu. For installation purposes, use the mouse to select the "All Tests" box, and select the "1" button for the number of times to be run. (See page #6). Ensure that the Printer and Fail Data are selected, so that any failures will be printed automatically.



The following is a list of the calibration programs located in the Calibrate menu in the Selftest Executive, with the three most likely boards or assemblies that could cause failures:

Test Name	#1	#2	#3
#1 AMS_RMUX_c	AMS	RMUX	MSP/ISO
#2 AMS_SIG3_c	AMS	MSP/ISO	RMUX
#3 AMS_DIFF_c	AMS	RMUX	ICAM
#4 DMS_c	DMS		
#5 ARB_v_c	ASB	MSP/ISO	AMS
#6 DA_v_c	ASB	MSP/ISO	AMS
#8 DIO_c	DIO	TH CONT/CPU	Selftest
#9 ADIO_c	ADIO	TH CONT/CPU	Selftest
#10 ADIO_dac_c	ADIO	AMS	RMUX
#12 MDE_c	MDE	TMS	AMS
#13 MDE_TGDC_c	MDE	TMS	AMS
#15 POWER_c	UUT Cont	AMS/RMUX	Selftest
#17 ISOAmp_c	MSP/ISO	AMS	RMUX

Any type of failure during calibration could indicate a hardware problem. If a failure during Functional was the reason that a calibration is being run, refer to the Selftest Failure Analysis sheet on page 8 of this section.



***Diagnostics***

## DIAGNOSTIC TOOLS

### SelfTest EXaminer (STEX) for Microsoft Windows 95

#### Overview

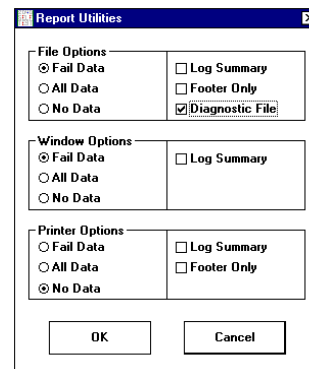
The STEX program may be used to help graphically interpret the results of any diagnostic output file generated by Digalog System's SelfExec program run on the Series 2040 testers. STEX uses the results of the diagnostic output file to show the configuration of the tester and evaluate possible problems with the tester resources based on failed test data and/or system errors during testing. STEX will use these results to 'decide' what the top three most likely resource problems are in the tester, based on Selftest output information. These results will be shown graphically on the STEX interface, highlighting and identifying the potentially problematic resources in the tester.

STEX can be very useful in aiding an operator who is troubleshooting possible problems in the Digalog testers by providing a graphical depiction of the location of potentially faulty tester resources. These resources include all Testhead boards, the Testhead power supplies, the variable power supplies and their controller modules, the computer with its Testhead controller card, and the Selftest unit itself.

#### Creating the Diagnostic File for STEX

To use STEX to analyze Selftest data, the proper information must be recorded in the Selftest output file first. A new user selection under SelfExec's output configuration has been added to provide this information. To obtain a diagnostic file for use in STEX, follow these steps when running SelfExec:

- 1) Under the 'File' menu, select 'Configuration'.
- 2) On the configuration form under 'File Options', select either 'Fail Data Only' or 'All Data' and select 'Diagnostic'.
- 3) Run the desired calibration and function tests.

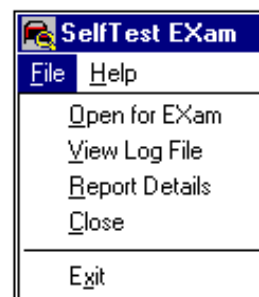


Selection of the 'Diagnostic' option for file output will create a file with all the information required by STEX to analyze the system. This information includes the tester type being run, a listing of the Testhead resources as recorded in the 'resource.ini' file or the Registry, and a listing of all tests run along with any problems encountered during the tests. These results will be written into a file in the 'digalog\bin\' directory. The filename is the date on which the test was run with the file extension '.dxx', where 'xx' is an incrementing number starting at '01' and going through '99'. For example, if the diagnostic file was written on January 20, 1997, the file name would be 'jan2097.d01'. If a second file were created on the same day, its name would be 'jan2097.d02', and so on. The first SelfExec file written each day would carry the extension '.d01'. If SelfExec's file option is not set to 'Diagnostic', the file extension would be '.001', '.002', and so on. These files do not contain the configuration information required by STEX and will not be accepted as proper files for analysis by STEX.

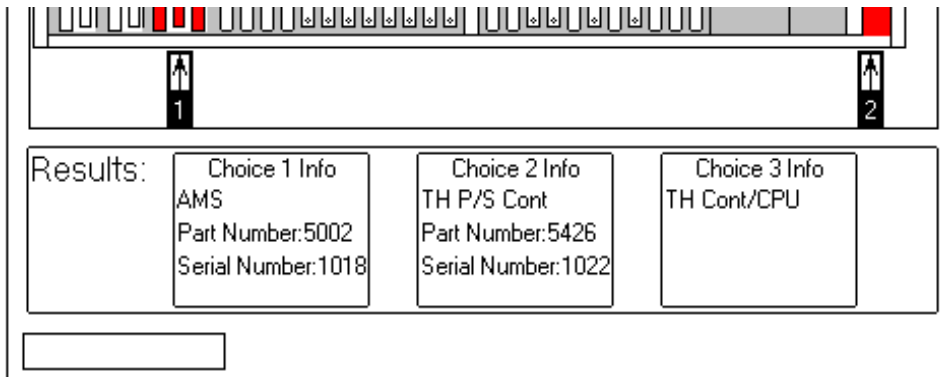
### Analyzing Selftest Data

When starting the STEX program, the graphics show the Testhead as being empty. Under the menu item 'File' are the selections: **O**pen for EXam, **V**iew Log File, **R**eport Details, **C**lose, and **E**xit.

**Open for EXam** - Selecting this menu item opens up a file selection window showing the files available in the 'digalog\bin\' directory with the '.dxx' file extension. Highlight the desired filename and Click on the 'Open' button to select for analysis under STEX. STEX will then open that file, and examine it to see if it is a valid file for this program. If the file is not valid for STEX, a message box will inform the user of this, and the graphics will return to their default condition. If it is valid, the tester resource information will be read in for analysis. The boards listed in the Registry will be placed in the proper slots in the Testhead graphic and the file will be inspected for any fail data from the tests listed. If fail data or system errors are found, the program will analyze those results using information about the tests located in the STEX database — 'digalog\include\stex.mdb'. The program will then use this information to calculate the three most likely tester resources that could cause the problems found in this diagnostic file.



All tester resources, by default, are either gray-colored or on gray background. The one to three resources calculated to be most likely causing the fault(s) will be highlighted in red. Also, the 'Results:' box on the lower portion of the form displays the information regarding these three tester resources. If the resource is a board in the Testhead, an arrow with a number 1-3 according to its



relative importance (1 being greatest) will point to the location of the board. An information box with the same number will display the board's description, Digalog part number, and serial number (if this information is available in the diagnostic file.) If the tester resource is not a board in the Testhead, the resource's graphic will be highlighted in red with a label indicating which 'Choice #' it is in relative importance. The information box with the 'Choice #' information will have the resource's description and other optional information regarding that resource.

If the SelfExec test 'TH\_config\_test' has logged fails in the current diagnostic file, a message box will be shown informing the user that this fault exists. Also, the 'Results:' box will display the message: "Config problems found" on a red background. The configuration of the Testhead will be displayed, but no specific tester resources will be tagged as being at fault as a result of this file's analysis. The test 'TH\_config\_test' examines and compares the contents of the Testhead to the recorded listing in the Registry. If a problem is found with this test, it cannot be automatically known where the source of the problem is without further investigation. Therefore, the user should refer to the Tester Resource Manager (TRMAN) section of this manual to proceed in troubleshooting this problem.

If any failure(s) or problem(s) are found in a valid diagnostic file, the menu item 'Report Details' will be enabled to show some details about those tests. See item 'Report Details' for more information.

If the diagnostic file is examined, and no fails or other problems were found with this test, the 'Results:' box will display the message: "No Problem Found" on a green background. The proper configuration for the Testhead will be displayed, but the menu item 'Report Details' will be disabled, since there are no failing tests on which to display information.

**View Log File** - Selecting this menu item opens a file selection window showing the available files, similar to the 'Open for EXam' item. Selecting a filename here will start the Microsoft Windows text editor program 'WordPad' and open the diagnostic file for viewing. Here, individual test results may be viewed to provide further possible insight into any problems with the tester.

Viewing the individual failures of a test may aid in troubleshooting an individual board. Examining any system error messages and referring to documentation for the source and/or meaning of the error may also help in resolving the problem with the tester resources. While viewing this file, the user may also elect to print the file contents.

**IMPORTANT!! The file being examined SHOULD NOT be edited. Changing any information in these files could render the information inaccurate or useless for diagnosing any problems with the tester.**

**Report Details** - This menu item is only available while there is a valid diagnostic file with fail information opened for examination. 'Report Details' is a listing of the individual Selftest programs that show at least one fail or system error during its execution.

Selecting this menu item will bring up a separate window with a list of the failed test programs. This list gives the name of the Selftest which had the problem, the slot number of the board being examined by that test, and whether the problem with the test was a test fail or a system

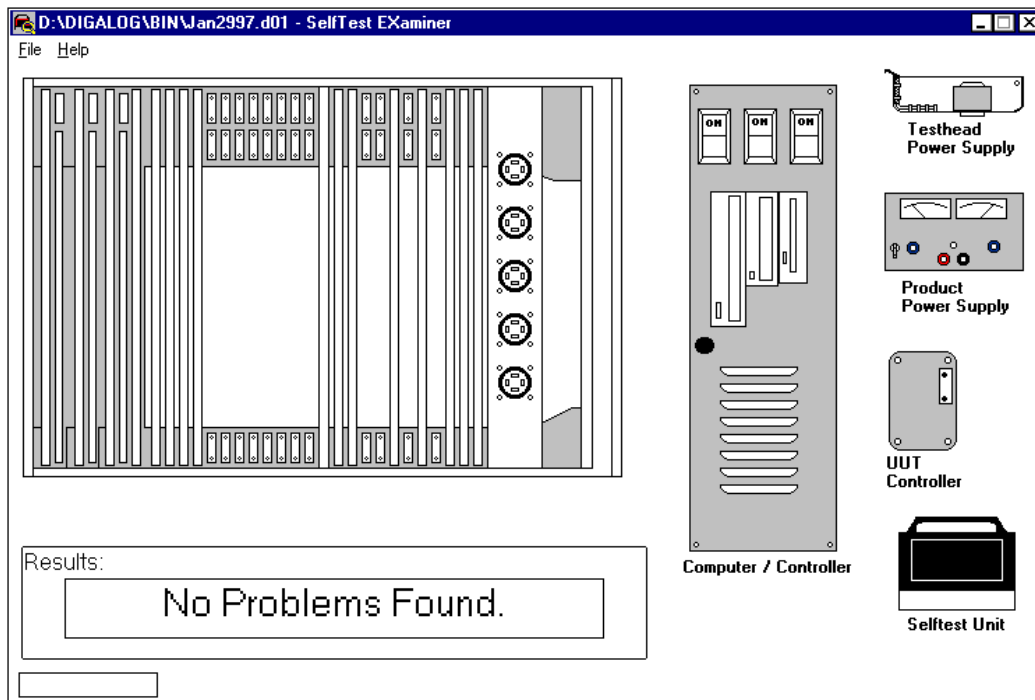
STEX Report Details		
File		
Test Name	Slot Number	Fault Type
afet_rft_f	Unknown	Fail(s)



error. If a test listed did not have any slot information listed in the results, the slot will be listed as 'Unknown'. To view the details of each individual fail or system error number from the test results, use the 'View Log File' menu item. Refer to the Selftest documentation to aid in interpreting these test results.

**Close** - Selecting this menu item closes the currently selected diagnostic file and clears all result information from the program's windows. This clears the on-screen Testhead board configuration and removes any individual test results from the 'Report Details' window. This menu item is provided only for the convenience of the user. It is not mandatory to 'Close' one test before opening another for exam. However, it may be used to provide an obvious separation in the examination of different test result sets.

**Exit** - Selecting this menu item closes the current diagnostic file, clears configuration information from the program, and closes and exits the program.



## TRMAN (Tester Resource Manager)

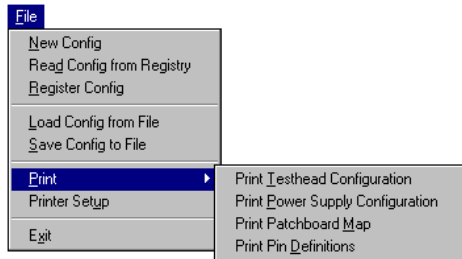
The Tester Resource Manager is used to track and manage the tester resources including all the boards in the Testhead and the UUT power supplies. Information about these resources can be automatically generated or manually defined, and is used to generate a Patchboard Interface Map and define the pin locations of these resources at the Patchboard. This information can be saved to a project specific file called resource.ini and can be used by other Digalog System's applications.

Specifically, the software is capable of printing out a "Patchboard Map" containing Patchboard pin mnemonics by either automatically interrogating the tester for its resources, or by asking the programmer to define the tester's resources. When the configuration is performed manually, it allows the programmer to configure additional resources beyond what the tester physically contains. In this manner, a programmer has the additional resources to generate programs and fixtures for any tester.

Board	0	0	1	1	2	2	3	3	4	4	5	5
	A	B	C	D	E	F	G	H	J	K	L	M
Row 1	POS0	POS0	+IA0	+OA0	AGND	DA0	A0	A0	AGND	DA12	DGND	DCLK
Row 2	POS0	+S00	-IA0	AGND	AGND	DA1	A1	A1	AGND	DA13	D0	D16
Row 3	NEG0	NEG0	+IA1	+OA1	AGND	DA2	A2	A2	AGND	DA14	R0	R16
Row 4	NEG0	-S00	-IA1	AGND	AGND	DA3	A3	A3	AGND	DA15	D1	D17
Row 5			+IA2	+OA2	AGND	DA4	A4	A4	AGND	DA16	R1	R17
Row 6			-IA2	AGND	AGND	DA5	A5	A5	AGND	DA17	D2	D18
Row 7	POS1	POS1	+IA3	+OA3	AGND	DA6	A6	A6	AGND	DA18	R2	R18
Row 8	POS1	+S01	-IA3	AGND	AGND	DA7	A7	A7	AGND	DA19	D3	D19
Row 9	NEG1	NEG1			AGND	DA8	A8	A8	AGND	DA20	R3	R19
Row 10	NEG1	-S01			AGND	DA9	A9	A9	AGND	DA21	D4	D20
Row 11					AGND	DA10	A10	A10	AGND	DA22	R4	R20
Row 12					AGND	DA11	A11	A11	AGND	DA23	D5	D21
Row 13	POS2	POS2			AGND	XR4	A12	A12	AGND	XR16	R5	R21
Row 14	POS2	+S02			AGND	XR6	A13	A13	AGND	XR18	D6	D22
Row 15	NEG2	NEG2			AGND	XR8	A14	A14	AGND	XR20	R6	R22
Row 16	NEG2	-S02			AGND	XR10	A15	A15	AGND	XR22	D7	D23
Row 17							A16	A16			R7	R23
Row 18							A17	A17			D8	D24
Row 19	POS3	POS3					A18	A18			R8	R24

## Menu Bar

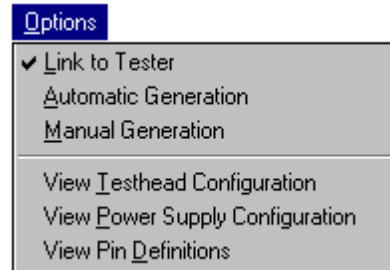
**File Menu** - The TRMAN File menu is similar to the standard Windows file



menu. It has selections for a **N**ew configuration, **L**oad an existing configuration, **S**ave a configuration, **S**ave an existing configuration As another file, and **E**xit. The **P**rint Utility as shown below will be discussed later in this section. For the purposes of this explanation, the file being used for illustrations is the standard resource.ini

file in the \Digalog\include\ directory.

**Options Menu** - When the Options menu is selected, a pull-down menu will be displayed prompting for a choice of the following: **A**utomatic generation, **L**ink to tester, **M**anual Generation, **V**iew pin **D**efinitions, and **V**iew Testhead configuration. Each of these options, along with the **P**rint utility from the **F**ile menu, will be briefly discussed.



**Link to Tester** - This item will toggle the link between the application and a tester. When checked, the application assumes a Testhead is present and enables Automatic generation. When using Tester Resource Manager on a development computer that is not connected to a Digalog tester, this item should never be checked as it could lead to corruption of certain memory locations.

**Automatic Generation** - If Automatic Generation is selected, the program scans the tester for its resources, and then updates the map of the Patchboard as shown on the next page. Tester resources required to generate the Patchboard map plus any other tester resources can also be saved to a resource file on the hard drive (resource.ini) stored in the Registry, or printed out.

All programmers writing code for the system should be familiar with this map, since it is the actual physical configuration of the Patchboard.

Board	0	0	1	1	2	2	3	3	4	4	5	5
	A	B	C	D	E	F	G	H	J	K	L	M
Row 1	POS0	POS0	+IA0	+OA0	AGND	DA0	A0	A0	AGND	DA12	DGND	DCLK
Row 2	POS0	+S00	-IA0	AGND	AGND	DA1	A1	A1	AGND	DA13	D0	D16
Row 3	NEG0	NEG0	+IA1	+OA1	AGND	DA2	A2	A2	AGND	DA14	R0	R16
Row 4	NEG0	-S00	-IA1	AGND	AGND	DA3	A3	A3	AGND	DA15	D1	D17
Row 5			+IA2	+OA2	AGND	DA4	A4	A4	AGND	DA16	R1	R17
Row 6			-IA2	AGND	AGND	DA5	A5	A5	AGND	DA17	D2	D18
Row 7	POS1	POS1	+IA3	+OA3	AGND	DA6	A6	A6	AGND	DA18	R2	R18
Row 8	POS1	+S01	-IA3	AGND	AGND	DA7	A7	A7	AGND	DA19	D3	D19
Row 9	NEG1	NEG1			AGND	DA8	A8	A8	AGND	DA20	R3	R19
Row 10	NEG1	-S01			AGND	DA9	A9	A9	AGND	DA21	D4	D20
Row 11					AGND	DA10	A10	A10	AGND	DA22	R4	R20
Row 12					AGND	DA11	A11	A11	AGND	DA23	D5	D21
Row 13	POS2	POS2			AGND	XR4	A12	A12	AGND	XR16	R5	R21
Row 14	POS2	+S02			AGND	XR6	A13	A13	AGND	XR18	D6	D22
Row 15	NEG2	NEG2			AGND	XR8	A14	A14	AGND	XR20	R6	R22
Row 16	NEG2	-S02			AGND	XR10	A15	A15	AGND	XR22	D7	D23

**Manual Generation** - If Manual generation is selected, the screen below will be displayed. Note that the Power Supply Distribution board is always in slot 0 and therefore does not show in the Testhead

**Manual Configuration**

---

**Product Power Supply Resources**

Channel Number:  PPS Type:  None  Variable  HPIB  GPIB

Patchboard Connection:  Voltage:  Current:  Hi limit:  Lo limit:  Serial Loop Position (0-4):  0  1  2  3  4

---

**Testhead Resources**

Slot Number:  Description:  Board Number:

	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8
Board Code	1A4	D07	6						
Board Switches	150	4	4						

---

**Tester Information**

Tester Serial Number:  Tester Description:

configuration table. From this utility, any system configuration may be generated. It is the users responsibility to make sure the generated configuration is valid.

The Programmable variable power supplies (maximum of five) may be defined in terms of maximum voltage and current once a Programmable Power Supply is selected (up/down button). With Volts or Amps selected, the jog shuttle located to the right modifies the selected value. The option buttons under the jog shuttle control determine what position in the serial loop that the supply being defined occupies. However, the variable supplies must be filled in a contiguous manner from #0 to #4. The spin control on the upper left corner of the dialog is used to determine which programming channel is being configured.

If a GPIB or HPIB power supply is being defined or added, the channel and type can be selected and the upper right of the dialog changes to allow the programmer to select a power supply type, a GPIB/HPIB Device number, and what Relay Control board will be used. The spin control on the middle left of the dialog (Patchboard Connection) is used to define which of the five Patchboard connections are connected to which supply, or if a GPIB/HPIB supply will use an external output (i.e. the supply's output does not physically appear on the Patchboard.)

The rest of the Testhead is displayed in table format by slot number. The Description and Board Number drop-down menus are directly linked to, and will modify the table. The Clear All button will clear all configuration items.

Board Codes are specific identifiers for the particular type of board selected for that slot. Board Numbers are used to define the resources of that particular board. For example, if there are two of the same type of board in the system, board numbers zero and one, the resources of board one will be numbered over and above those of board number zero. In other words, for a Relay Multiplexer Board containing sixty-four channels, board zero channels would be labeled zero through sixty-three and board one channels would be labeled sixty-four through one hundred and twenty-seven.

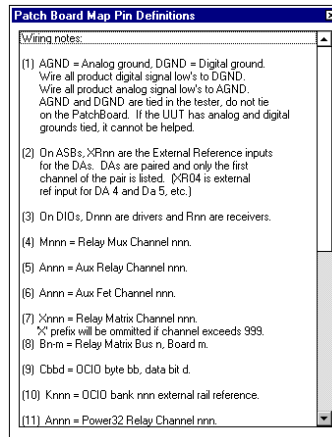
The table is directly linked to the slot drop-down menu, therefore any slot changes in either place will be reflected in the other.

**View Testhead Configuration** - This utility displays the entire Testhead configuration in an organized format. An example of a typical Testhead

Test Head Configuration				
SLOT	Code	Number	Board description	Description of pins
slot 0	104	00	TestHd P/S Conn.	
slot 1	B	00	Instrumentation Amp	Amps 0-3
slot 2	6	00	Analog Source Board	DA 0-11 and ARB 0-1
slot 3	C	00	Auxilliary Relay	Relay 0-31
slot 4	6	01	Analog Source Board	DA 12-23 and ARB 2-3
slot 5	7	00	Digital I/O	Bytes 0-3
slot 6	193	02	Adjustable Level DI/O	Bytes 8-11
slot 7	3	02	Auxilliary FET	FET 64-95
slot 8	C	01	Auxilliary Relay	Relay 32-63
slot 9				
slot 10	2	01	Relay Multiplexor	Mux channels 64-127
slot 11	2	00	Relay Multiplexor	Mux channels 0-63
slot 12	14	00	VI Source	Channel 0-1
slot 13				
slot 14	D08	01	Open Collector I/O	Bytes 8-15
slot 15				
slot 16				
slot 17				
slot 18				
slot 19				
slot 20	5	03	Matrix Relay	Mrlly chan 192-255
slot 21	5	02	Matrix Relay	Mrlly chan 128-191
slot 22	5	01	Matrix Relay	Mrlly chan 64-127
slot 23	5	00	Matrix Relay	Mrlly chan 0-63
slot 24	8	00	Amplitude Measurement	No pin definitions
slot 25	9	00	Time Measurement	No pin definitions
slot 26	A	00	Measurement display	No pin definitions

configuration is shown below.

**View Pin Definitions** - This utility from the Options menu explains the mnemonics used in the Patchboard map as shown to the right.



**View Power Supply Configuration** - If this option is selected, a grid is displayed showing all of the power supplies present, along with the type, name, device designation, and Patchboard connection for each supply as shown below.

Unit	Type	Name	Device	Patchboard Connection
PPS 0	Variable	55V - 10A	Serial 0	0
PPS 1	Variable	55V - 10A	Serial 1	1
PPS 2	HPIB	HP6038A (Channel 1)	DEV5	2
PPS 3				
PPS 4				
PPS 5				
PPS 6				
PPS 7				
PPS 8				
PPS 9				
PPS 10				
PPS 11				
PPS 12				
PPS 13				
PPS 14				

**Print Utility** - When this utility is selected from the File menu, a small inputbox is displayed prompting for a specific serial number for the printout to be generated. If a specific tester's configuration is to be generated, enter the serial number in the textbox. If not, merely select the OK command button, press <Enter> on the keyboard, or select Cancel. After this inputbox is satisfied, select an individual printout to be generated, or select all three options.

## TESTHEAD - PATCHBOARD - UUT P/S BUILT-IN DIAGNOSTICS

When a malfunction is suspected in either the Testhead Internal or Patchboard Power Supply system, the LED status indicators should be examined. The top LEDs are labeled for their respective power supplies as shown on page 14. The legend for the four lower LEDs is shown below. In case of a power supply malfunction, the power supply that has shut down first will be indicated by its respective LED being extinguished.

If you are diagnosing the case of no power at the Patchboard, and the status indicators, the lower four LEDs, are all lit, then an over/under voltage fault has occurred in a Patchboard power supply. The power supply causing the fault will have its respective LED extinguished. Power could also have been removed from the Patchboard without generating a fault condition. In this case, the reason that the power has been removed is indicated by one or two of the lower four status LEDs being extinguished.

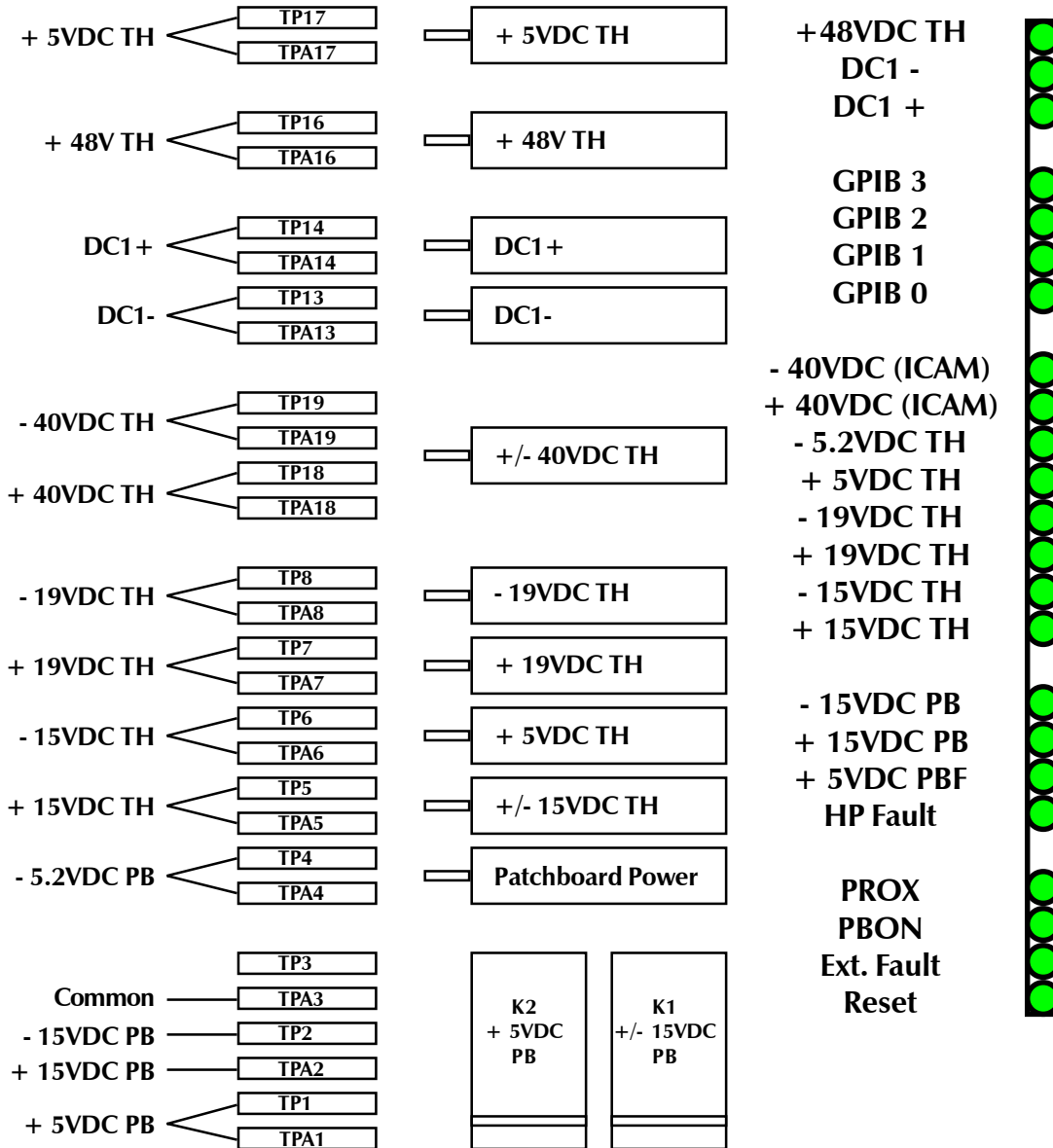
CASE	PROX	PBON	Ext.Fault	Reset
Power Call	on	off	on	on
TCLEAR	on	off	on	off
Patchboard removed	off	on	on	on
UUT Power Fault	on	on	off	on

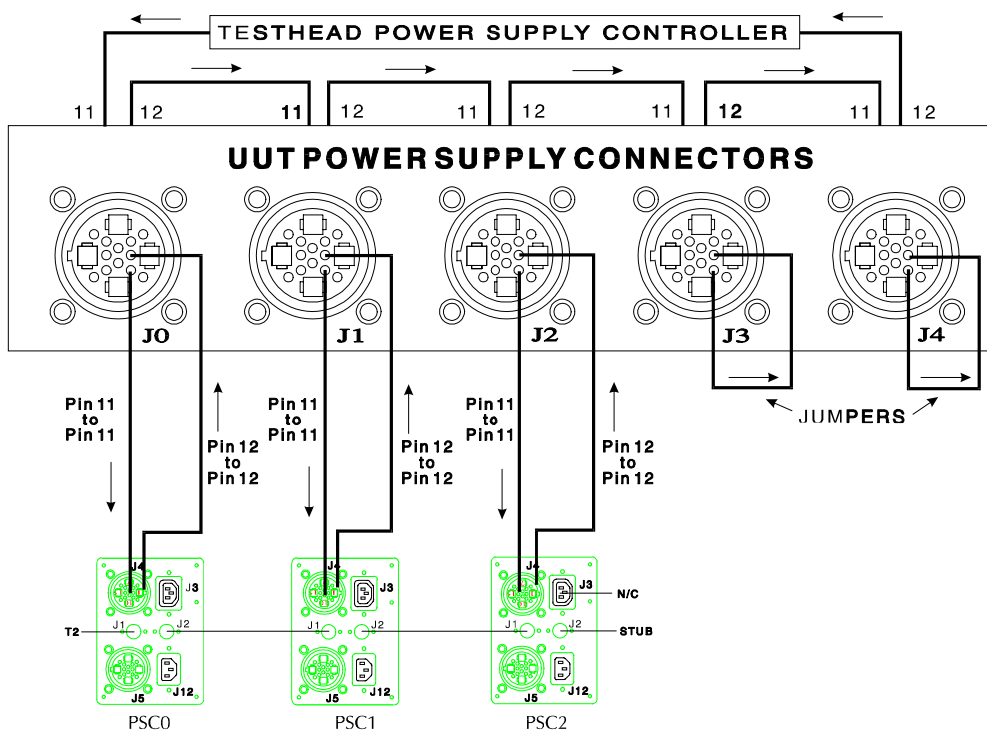
When a power supply cannot be restored by resetting the unit, the circuit breaker for the offending supply should be checked for continuity. A graphic of the circuit breakers on the edge of the Testhead Power Supply Controller board is shown on page 14 of this section. If any of these breakers continually trips, the associated power supply must be replaced.



**Breakers and Test Points**

**LED Indicators**



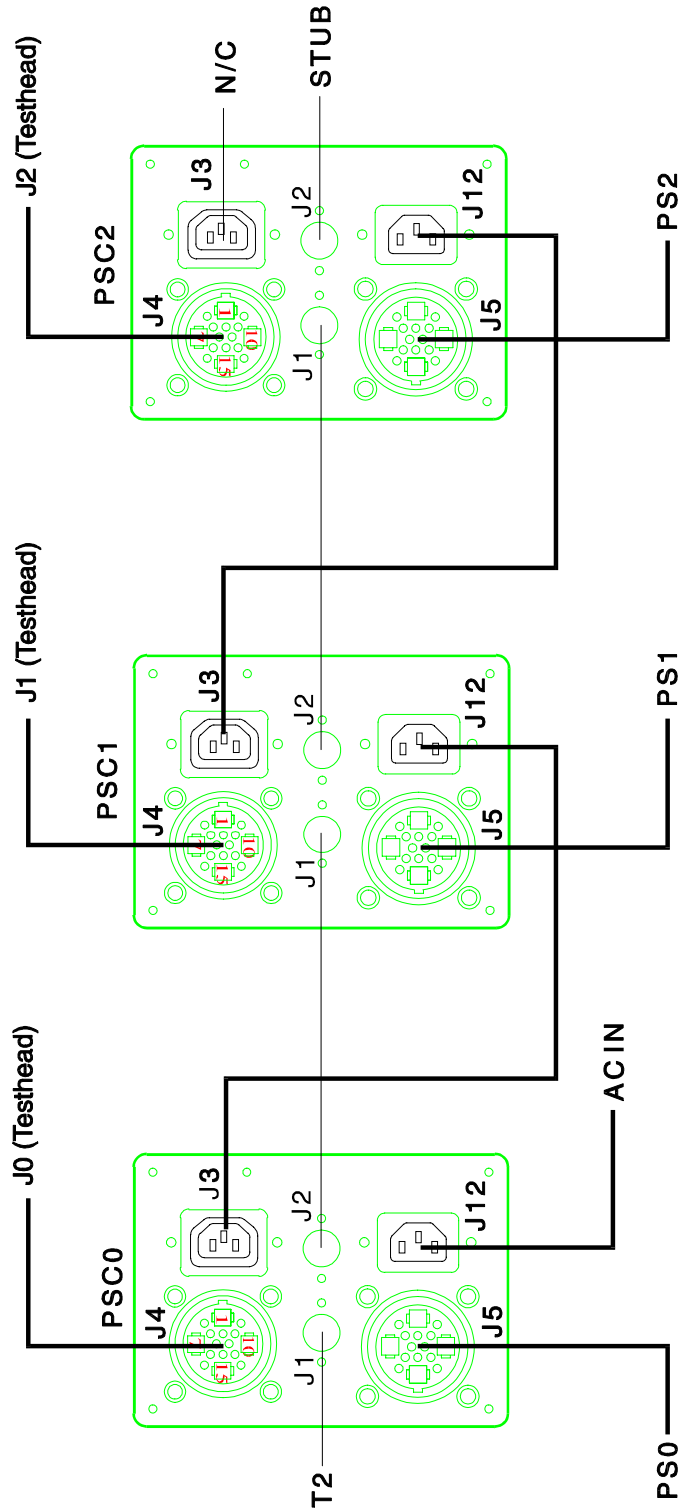


**TYPICAL POWER SUPPLY FAULT LOOP CONFIGURATION**

## FAULT LOOP

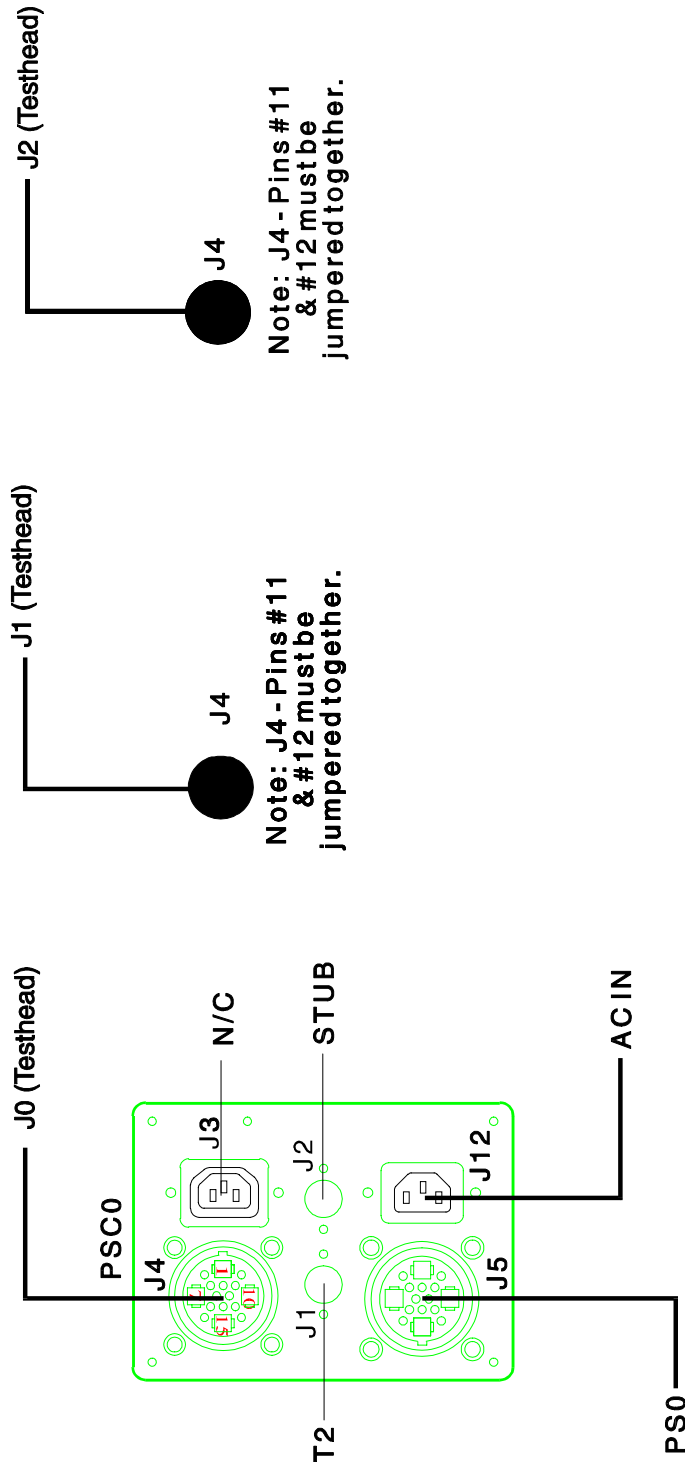
The Series 2040 Test System incorporates a “fault loop” for troubleshooting and self-diagnostics. The cable between the UUT Power Supply Controller and the Testhead, besides providing a path for the power supply output, contains the fault loop. If the fault loop is broken, it will cause the controller to shut down and report an error to the computer (the next time the computer tries to give it a command). The fault loop is broken by the controller itself whenever the controller detects an error. This signals to the other controllers that they too should shut down. If a controller for a power supply channel is unresponsive and the “Ext.Fault” LED on the Testhead Power Supply Controller is on, a communication problem exists between the CPU and the controller. If the LED is out, the fault loop is probably broken.

The power supplies may be isolated for diagnostics as shown in the following pages. If a supply is isolated and fails to power up, it is most likely the problem. If a supply is isolated and powers up, it can be eliminated as the cause of the failure.



# UUT Power Supply Controller Wiring

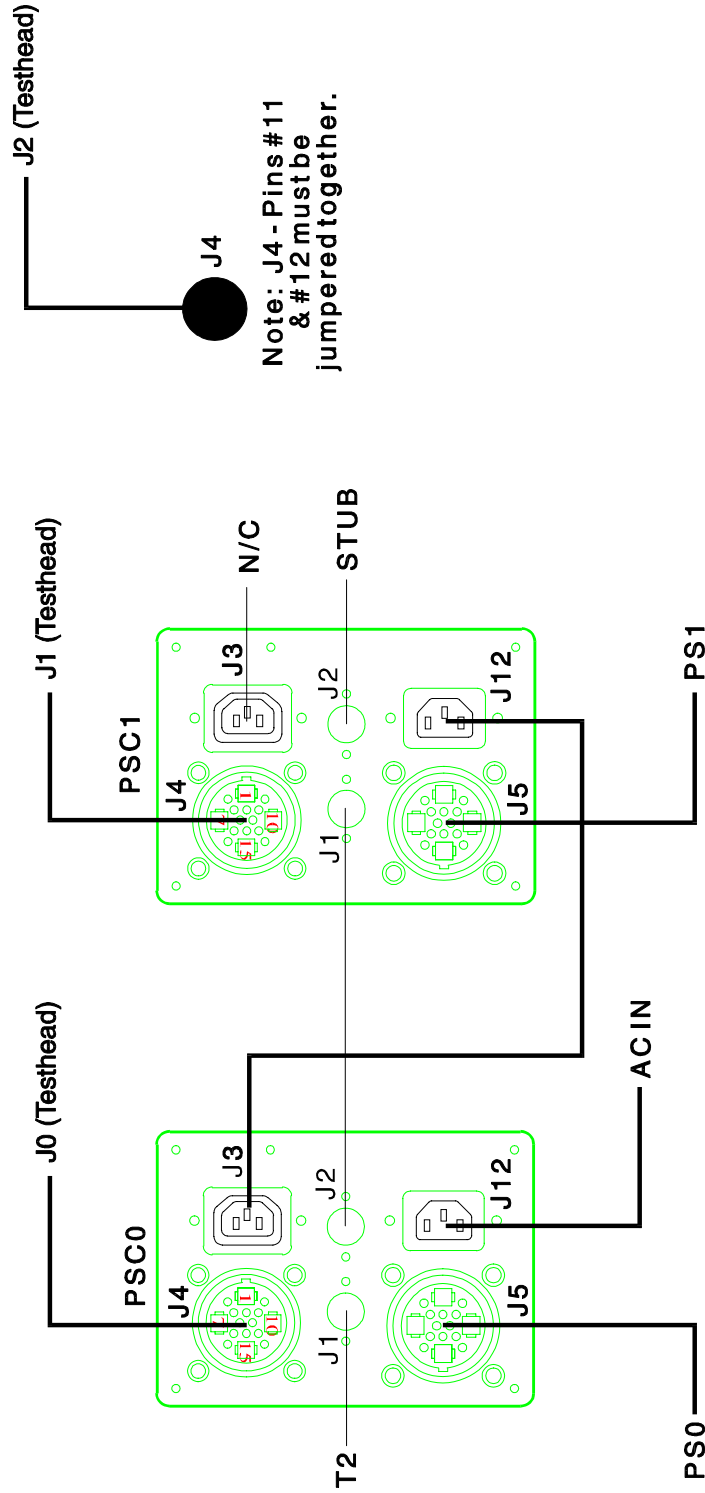
(Typical configuration)



# UUT Power Supply Controller Wiring

## Testing Power Supply 0

### Isolating Power Supplies 1 and 2



## UUT Power Supply Controller Wiring Testing Power Supplies 0 and 1 Isolating Power Supply 2

## **GPIB/HPIB POWER SUPPLIES**

The Series 2040 Test System may also contain one or more GPIB/HPIB Power Supplies. These supplies communicate with each other and the computer via an IEEE-488 bus. In addition, they use a Fault/Inhibit loop for voltage/current protection and this loop also connects to the Testhead Power Supply Controller.

Some of these supplies may have more than one output channel. In these situations, each separate output of each GPIB/HPIB supply is assigned its own channel or unit number. Programming is accomplished using Digalog's PowerUUT functional call. Over/under voltage/current limits for these supplies and channels are listed in the "resource.cat" file. For programming purposes, these power supplies act in the same manner as the Digalog UUT Product Power Supplies.

### **Troubleshooting Hewlett-Packard Power Supplies**

The fault/inhibit loop for the Hewlett Packard power supplies links each HP power supply serially with each other and with the PSC board. It is completely independent of the UUT P/S controllers' (external) fault loop and the fault loop for each non-HP GPIB power supply.

The PSC board will recognize a fault generated by the HP fault/inhibit loop only if the registered power supply configuration (set up by TRMAN) contains at least one HP power supply whose "resource.cat" entry has its "Fault Capable" property set to "1."

The "HPF" LED on the PSC board will turn off whenever an HP power supply has either detected an internal error condition, such as overvoltage, or has been "faulted" by the PSC board, but only after a HP power supply has been programmed following a Testhead power-up or the TClear event.

The fault signal driving the HPF LED on the PSC is not latched. Also, if the reset jumper shunt on the PSC board is installed, only the Proximity-Switch LED will turn off when the Patchboard fixture handle is disengaged. It will then turn back on when the handle has re-engaged. The PSC board will drive its HP fault/inhibit loop connection low every time that it detects a fault from any source whether or not any HP power supplies are registered or even present.

For a system containing “n” number of HP power supplies, the PSC board drives the +Inhibit (input) line of HP P/S #n low relative to its -Inhibit (input) line. When this power supply detects that its +Inhibit input signal is low, then it drives its +Fault (output) signal low relative to its -Fault (output) signal. These fault output lines are connected to the inhibit input connections of HP P/S #(n-1). Upon its detection that HP P/S #n has driven its +Inhibit (input) signal low, HP P/S #(n-1) will then “fault” HP P/S #(n-2) using its fault (output) connections. Thus, each HP P/S in the fault loop will “fault” the power supply preceding it in the loop all the way to HP P/S #0. The Fault (output) lines of HP P/S #0 connect to the PSC board, which allows that power supply to signal the PSC board that an error has been detected by one of the HP power supplies.

Upon detection of an internal error condition, such as overvoltage, or the external inhibit (input) signal, the HP power supply will program its output(s) to 0.0V @ 0.0A, disable its output(s), and assert its fault (output) signal. If an HP power supply detects an internal error condition, it will then drive its +Fault (output) line low to signal the next HP power supply positioned below it in the loop. Eventually, the “fault” signal will reach HP P/S #0, and it, in turn, will trigger the PSC board. The PSC board will then latch HP P/S fault condition and drive all of its fault output connections, including that for the HP power supplies. This will “fault” all of the HP power supplies positioned after the one which detected the internal error condition. The initial faulting HP power supply will also have its +Inhibit (input) connection driven low by the power supply following it.

To determine which HP power supply detected an internal error condition, press the “Local” button and then the “Prot” button on each HP power supply. All of the HP power supplies that were “faulted” by their following brethren via their inhibit (input) lines will display the letters “RI,” which stands for “Remote Inhibit,” in its LCD display. The single HP power supply that displays something other than “RI” in its LCD display is the power supply that detected an internal error condition. Consult its operating manual to determine the cause of the internal error condition.

If some or none of the HP power supplies are disabled via their fault/inhibit loop connections when the PSC board detects a fault from some other source, such as the proximity switch, proceed with the following troubleshooting procedure.

- 1) Verify on the relay controller board (0000-5X44) that pin #3 relative to pin #4 of connector P3 (PSC Port) is low or at a logic "0." If not, a problem exists on the PSC board, in the fault/inhibit cable from the PSC board to connector P3, or with connector P3 .
- 2) Otherwise, verify that pin #3 relative to pin #4 of connector P5 which mates to the first relay disconnect board is low or at a logic "0." If not, a problem exists on the relay controller board.
- 3) Otherwise, on the first relay disconnect board, verify that pin #3 relative to pin #4 of connector P1 (which mates to the relay controller board) is low or at a logic "0." If not, a problem exists either with connector P1 or else with connector P5 on the relay controller board.
- 4) Otherwise, verify that pin #3 relative to pin #4 of connector P3 (which mates to the next relay disconnect board) is low or at a logic "0." If not, a problem exists between connectors P1 and P3 on the relay disconnect board.
- 5) Otherwise, on the second relay disconnect board, verify that pin #3 relative to pin #4 of connector P1 (which mates to the first relay disconnect board) is low or at a logic "0." If not, a problem exists either with connector P1 or else with connector P3 on the first relay disconnect board.
- 6) Repeat steps #4-5 for the second and all subsequent relay disconnect boards up to and including the last relay disconnect board.
- 7) Jumper shunts #7-8 (which connect the corresponding inhibit and fault signals) on the last relay disconnect board must be installed. Verify continuity from pin #3 of connector P1 through jumper shunt #8 to pin #4 of connector P2 (which connects to the fault/inhibit cable for the HP power supply). Verify continuity from pin #4 of connector P1 through jumper shunt #7 to pin #3 of connector P2.
- 8) Otherwise, verify that pin #4 relative to pin #3 of connector P2 is low or at a logic "0." If not, a problem exists on the relay disconnect board, in its fault/inhibit cable, or with the HP power supply's inhibit input pins. Verify the continuity of each wire in the fault/inhibit cable,



and verify that each wire is connected to the proper terminal on the HP power supply. The HP power supply may be configured to use its inhibit input pins as simply digital I/O pins. Consult its operating manual to determine the correct position of the internal configuration jumper shunt for "Fault/Inhibit" operations, and then remove its cover to confirm the shunt's proper placement.

9) Otherwise, verify that an arrow exists above the word "Prot" on the LCD display. If not, the HP power supply itself is faulty.

10) Otherwise, verify that pin #1 relative to pin #2 of connector P2 on the relay disconnect board is low or at a logic "0." If not, a problem exists in the HP power supply, in the fault/inhibit cable for this supply, on the relay disconnect board for this supply, on the relay disconnect board for the previous supply, in the fault/inhibit cable for the previous supply, or in the previous HP power supply itself.

11) Otherwise, verify that pin #1 relative to pin #2 of connector P1 (which mates to the previous relay disconnect board) is low or at a logic "0." If not, a (continuity?) problem exists on the relay disconnect board.

12) Otherwise, on the previous relay disconnect board, verify that pin #1 relative to pin #2 of connector P3 (which mates to the next relay disconnect board) is low or at a logic "0." If not, a problem exists either with connector P3 or else with connector P1 on the next relay disconnect board.

13) Repeat steps #8-12 for each previous relay disconnect board up to and including the first relay disconnect board.

14) Otherwise, on the relay controller board, verify that pin #1 relative to pin #2 of connector P5 (which mates to the first relay disconnect board) is low or at a logic "0." If not, a problem exists either with connector P5 or else with connector P1 on the first relay disconnect board.

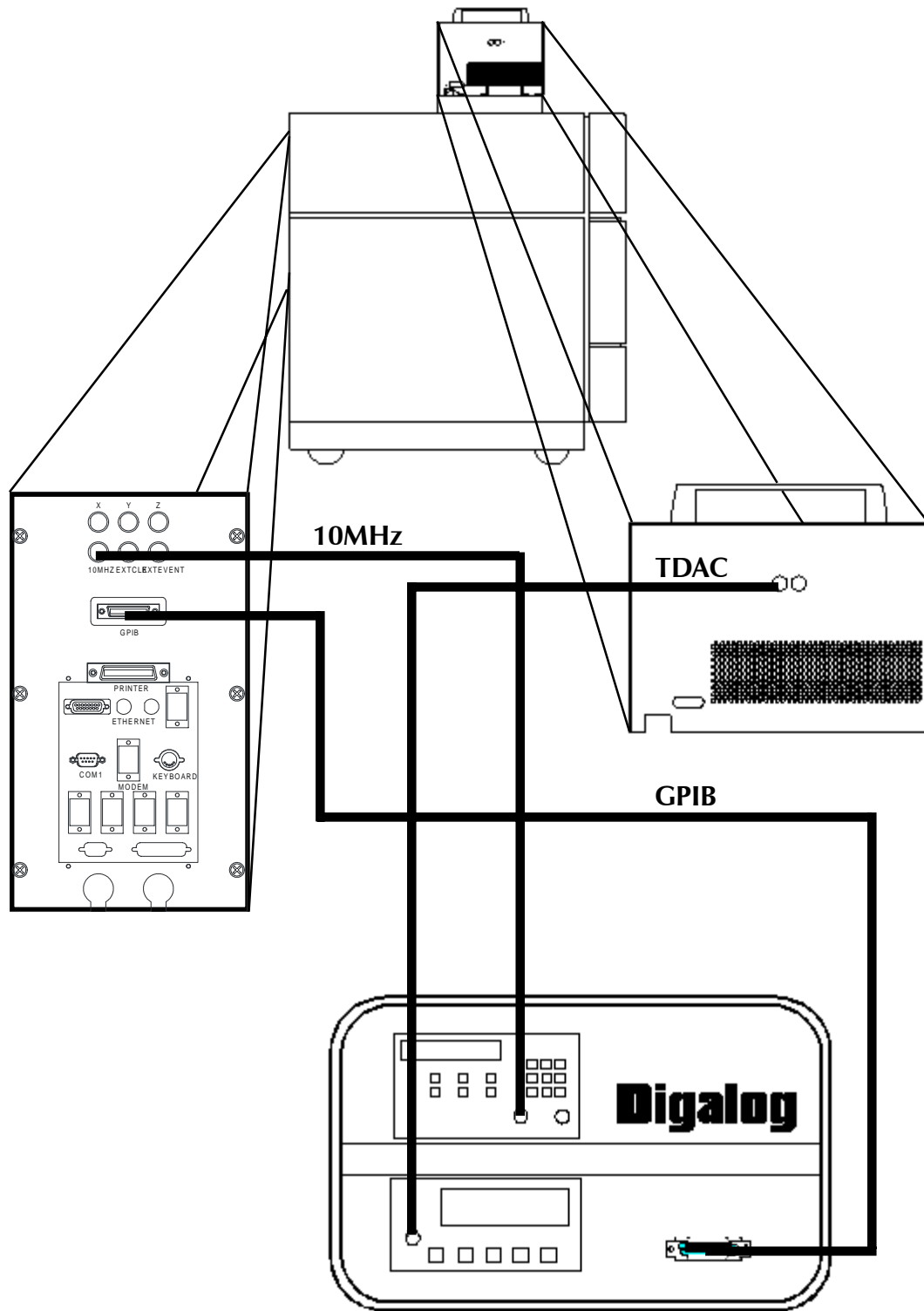
15) Otherwise, verify that pin #1 relative to pin #2 of connector P1 (PSC Port) is low or at a logic "0." If not, a problem exists on the relay controller board, in the fault/inhibit cable from the PSC board, or on

the PSC board itself.

Note: If there are no wires in the fault/inhibit cable of the HP power supply for the fault and inhibit signals (pins 1-4 on connector P2), then jumper shunts #9-10 (Fault/Inhibit Bypass) must be installed.



***Certification***



## CERTIFICATION

System certification ensures that the system standards that are used for Selftest and calibration are accurate, and can be traced to the National Institute of Standards and Technology (NIST). There are two elements of the Series 2040 Functional Test System that need to be certified:

- 1) The TDAC high precision digital to analog converter on each Selftest unit.
- 2) The TCXO precision oscillator on the Time Measurement System (TMS) in the 2040 Testhead.

To perform a certification, the following equipment is necessary:

- 1) A Digalog Calibration Station
- 2) A Digalog Selftest assembly (Mounted on the 2040)
- 3) A printer (if a hard copy certificate is desired)

The Calibration Station contains a precision digital multimeter and a precision counter/timer. Both instruments are equipped with a GPIB interface so that the certification process (in terms of instrument setup and measurement processing) is completely automatic.

## Setup

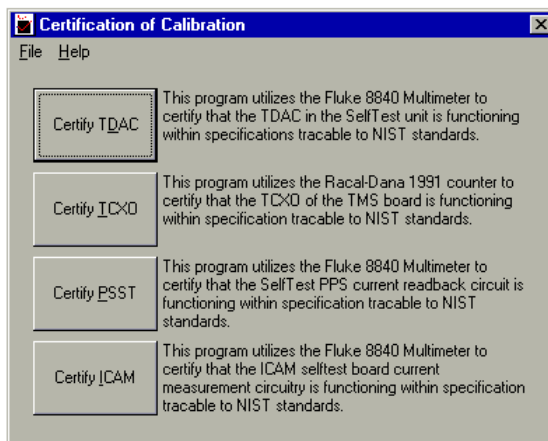
A number of connections between the 2040 and the Calibration Station must be made before continuing. These are:

- 1) Installation of the Selftest assembly. (See page 2-1.)
- 2) Power connections for the Calibration Station.
- 3) GPIB IEEE-488 communication link between the 2040 and the Calibration Station.
- 4) Connections between the TDAC port on the Selftest assembly and the multimeter.
- 5) Connections between the 10MHz output of the TMS in the Testhead and the counter/timer.

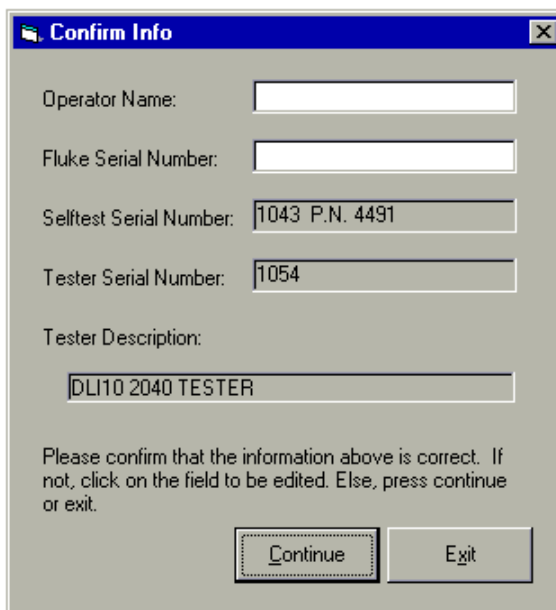
Using the interconnect on the left page, hook a BNC cable from the 10MHz connector on the back panel of the 2040 Console to the "A" input of the Frequency counter of the Calibration Station. Using another BNC cable, connect the TDAC signal from the Selftest unit to the Multimeter on the

Calibration Station. Finally, connect the GPIB port from the 2040 console to the GPIB port on the Calibration Station.

To run the program select the certification icon from the Atart/ Programs/Digalog program group, and the screen to the right will appear prompting for the type of calibration. Select the TDAC, and the screens in the right column on both this page and the following page will appear in the order shown.



The first screen prompts for the user's name, the serial number of the 8840 Fluke multimeter in the Calibration Station. This number can be found on a Digalog tag inside the Calibration Station next to the meter. It also prompts for the Selftest Assembly serial number, and the serial number of the tester itself.



When the information is entered, the last setup screen will appear requesting a verification of the information that was entered. If any of the information is incorrect, it can be modified or changed at this time.

The operator's name, Selftest serial number, and Fluke 8840A meter serial number must be entered and verified before the unit can be certified. Click on the "Certify" button and the program checks the TDAC signal. Test results and a pass/fail condition are displayed in the

screen shown below.

Test #	Target Volts	Actual Volts	Error Volts	Status
--------	--------------	--------------	-------------	--------

Tester Description: DLI10 2040 TESTER

Selftest Serial Number: 1043 P.N. 4491

Tester Serial Number: 1054

Certified on: 11/02/1998 1:08:51 PM

Test Operator: Mike Moran

Fluke Serial Number: 5161005

**Test Results:**

Print    Certify    Cancel

When this portion of the certification is complete, the TCXO frequency must be checked. The procedure for the frequency certification is identical, except for the final screen displaying the frequency counter. The user should wait until the frequency is stable, and then click on certify to start the test. Again, the results and a pass/fail condition are displayed.

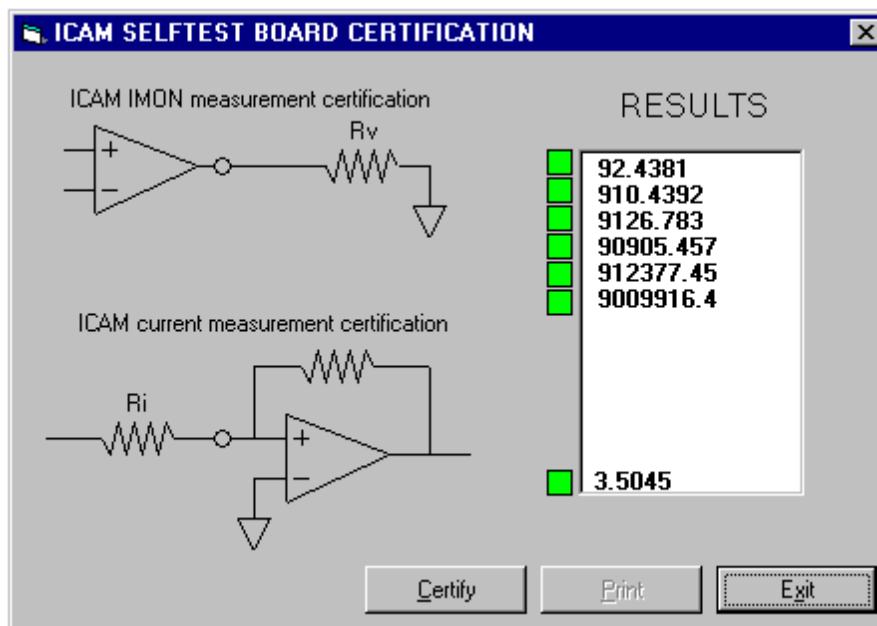
For the portion dealing with the TDAC, the measured value must not vary from the programmed value by more than the designated limits or a failure will result. If this happens, a manual adjustment must be made. Contact Digalog Systems should this occur.



If the TCXO fails the preset calibration limits, it will also require a manual adjustment. Again, contact Digalog Systems should this occur.

The procedure for the Selftest PPS current feedback circuit is almost identical to the first two certification procedures. Follow the instructions displayed on the screen.

The fourth procedure certifies the ICAM Selftest current measurement circuitry, and the last certification screen is shown below.



Connect the ICAM Certification cable from the white connector on the ICAM Selftest board to the Fluke 8840 Multimeter.

The ICAM IMON measurement certification tests the circuitry over six different ranges with the results displayed to the right of the dialog. The result of the current certification is also displayed. If any of these readings are out of range, the small box adjacent to the result will appear red instead of green.

# *Module Repair & Replacement*

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**REPAIR AND REPLACEMENT PROCEDURES**

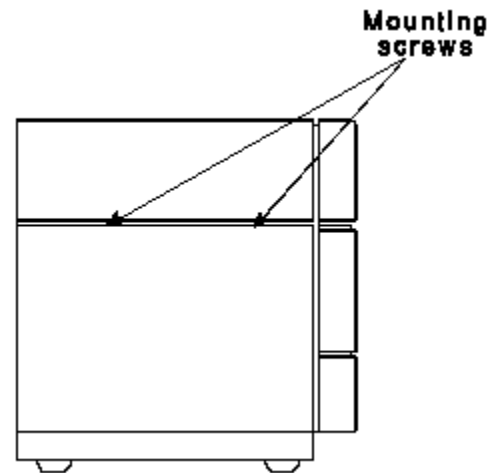
Upon determining that a part is defective, the customer should:

- 1) Contact Digalog Systems at (414) 797-8000 to obtain an RMA (Return Materials Authorization) number and be prepared to supply the part number and serial number of the defective part. If the part is not covered under warranty or a support contract, the customer must provide a method of payment for the repairs.
- 2) Return the defective part and reference the RMA number. All equipment being returned to Digalog Systems should be shipped prepaid and insured at the customer's expense.
- 3) All circuit boards to be returned to Digalog Systems must be shipped in static shielding bags and packed in anti-static packaging material. Digalog Systems will pay the return freight, within the continental United States on a warranty issue. Digalog Systems is not liable for consequential shipping damages.
- 4) Out-of-warranty repairs will be done on a time-and-materials basis (or may be covered under a Support Agreement.)

## COMPUTER ASSEMBLY

When it is determined that a problem exists in the computer assembly itself, the entire assembly must be sent back for repair. To remove the computer assembly, proceed as follows:

- 1) Ensure that the main power cord is unplugged from the wall outlet.
- 2) Remove the two side panel mounting screws from the console as shown to the right.
- 3) Lift up the side panel and remove it.
- 4) Remove the two screws from the front edge of the inner panel and swing it out to expose the computer assembly.



- 5) Carefully remove all of the cables from the rear of the computer assembly noting where each individual cable was connected.
- 6) The computer assembly is held in place by four bolt assemblies with rubber bumpers on them. Relieve the tension on all four bolt assemblies until the computer moves easily forward and backward.
- 7) Remove the computer assembly from the front of the tester and send it to Digalog for repair.

To reinstall the computer assembly, reverse this procedure.

## INTERNAL AND PATCHBOARD POWER SUPPLY OVERVIEW

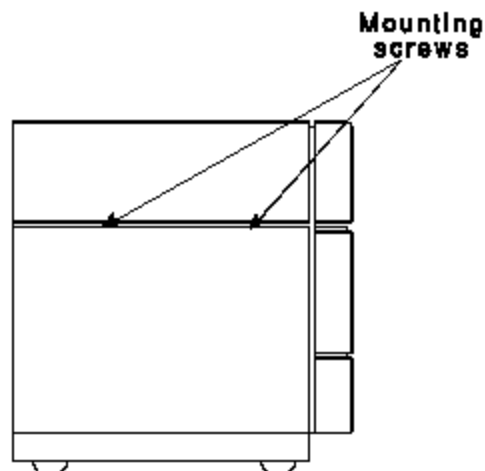
The Testhead Power Supply Controller monitors Testhead power supplies for overvoltage with OVP crowbar IC's. When an overvoltage is detected, the OVP IC quickly short circuits the offending power supply. This produces an undervoltage state on that power supply. This is, in turn, sensed by an opto-isolated comparator to produce a digital fail signal. This digital signal is latched in the control circuit and removes the AC line power from the Testhead Internal and/or Patchboard Power Supplies. The state of all comparators is indicated by the LEDs mounted on the top edge of the controller circuit card. An illuminated LED in the power supply group indicates a normal condition. The "PBON", "RESET", "PROX" and "EXTERNAL FAULT" LEDs, when all are illuminated, indicate that power is applied to the patchboard. The extinguishing of any LED shows the reason for the loss of power to the Patchboard and/or the Testhead. A dedicated power supply on the controller circuit card maintains its function without regard to the monitored supplies. The result of the logical OR of any Testhead Internal Power Supply failure is logically OR'd with any Patchboard Power Supply failure. The result of this is provided as a current loop signal through an opto-isolator to the UUT Power Supply Controller. Therefore, when a fault is detected in the Testhead Internal Power Supply, all power supplies are shut down. If the fault originates in the Patchboard Power Supply, the Testhead Internal Power Supply remains on.

The Testhead Power Supply Controller also responds to three external logic signals. They are the Patchboard Open Sensor, CPU ON/OFF command and Reset. A proximity detector, located near the Patchboard, senses the release of the Patchboard and causes a shutdown of the Patchboard Power Supplies, and indirectly the UUT Power Supplies. The CPU ON/OFF command (see the functional call POWER) is a programmed command where a "0" causes the Patchboard Power Supplies to shut down without a detected fault condition. A "1" enables the Patchboard Power supplies. The Patchboard Power is removed when a Testhead reset is issued. (See the TCLEAR functional call in the Programming Manual). When the Patchboard Power Supplies are shut down, they are also disconnected from the Patchboard via relays.

**TESTHEAD & PATCHBOARD POWER SUPPLY REPLACEMENT**

**WARNING! Remove main power from tester before proceeding.**

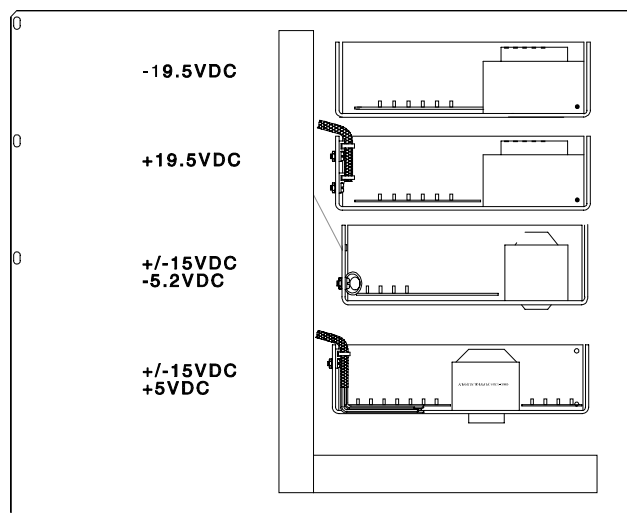
- 1) Ensure that the main power cord is unplugged from the wall outlet.
- 2) Remove the two side panel mounting screws from the console as shown to the right.
- 3) Lift up on the side panel and remove it.
- 4) Remove the two screws from the front edge of the inner panel and swing it out to reveal the four power supplies.



- 5) Locate the proper Testhead or Patchboard power supply connector for the supply to be replaced and disconnect it from the Testhead Power Supply Controller. Use the legend below.

- 6) Remove and replace the faulty power supply, taking care to route the new cable exactly the same as the old one.

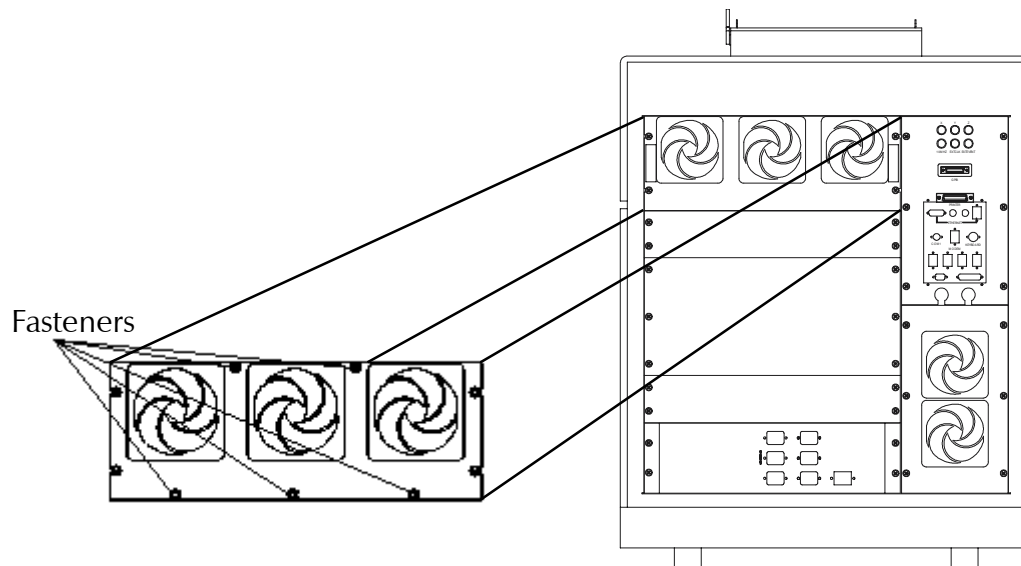
**J7** - +5VDC, +15VDC  
**J8** - -5.2VDC, +15VDC  
**J9** - +19VDC  
**J13** - +5VDC



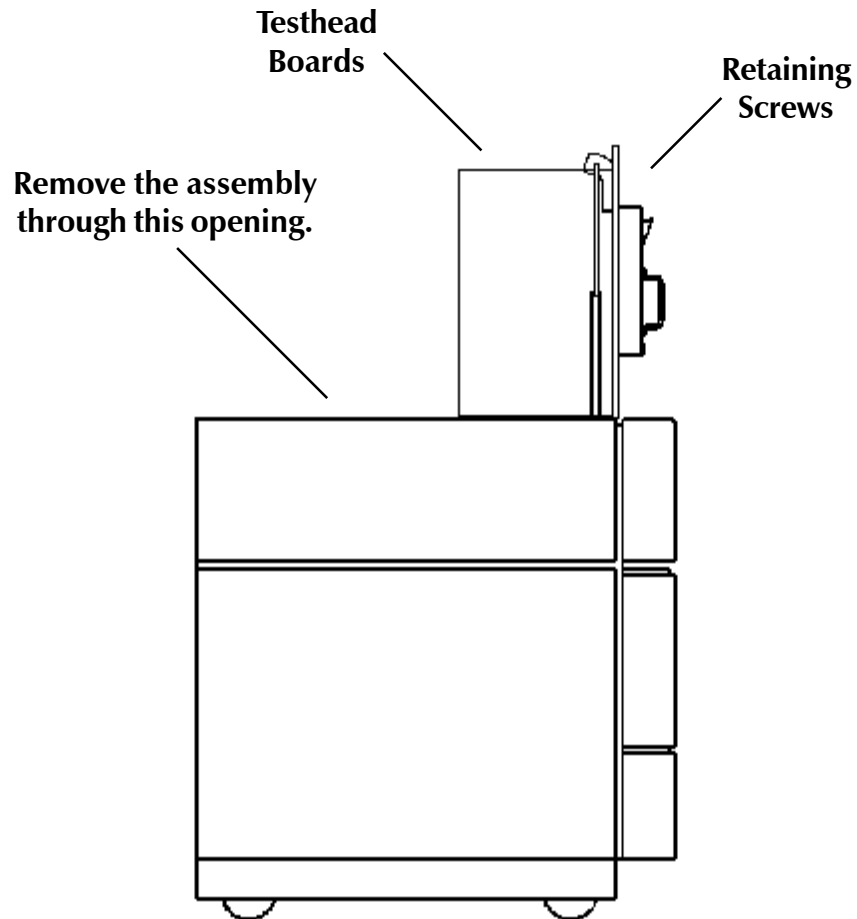
### +5VDC Testhead Power Supply

The Testhead cooling fan assembly contains the main +5VDC Power Supply for the Testhead. If it is determined that the supply is faulty, the recommended procedure would be replacement of the entire assembly as described below:

- 1) Remove the four screws on the sides of the Testhead cooling fan assembly, and draw the assembly towards you 2 to 3 inches.



- 2) Remove the five fasteners for the filter housing plate as shown above, and remove the plate from the cooling fan assembly.
- 3) Loosen the two Testhead retaining screws located along the back of the black Testhead cover, by turning them 1/4 turn counterclockwise. Using the handle, lift the Testhead into the position shown on the next page.
- 4) Remove the hazard cover from the Testhead by removing the mounting screw from each end of the cover.
- 5) Disconnect the supply wiring harness from connector J13 on the Testhead Power Supply Controller board.



- 6) Disconnect the AC fan power cord from the Testhead section of the AC Distribution box.
- 7) Remove and replace the assembly through the Testhead bay, taking care to route the wiring for the new Testhead fan assembly exactly as the old wiring was routed.
- 8) To reinstall the supply, reverse steps 1 - 7.

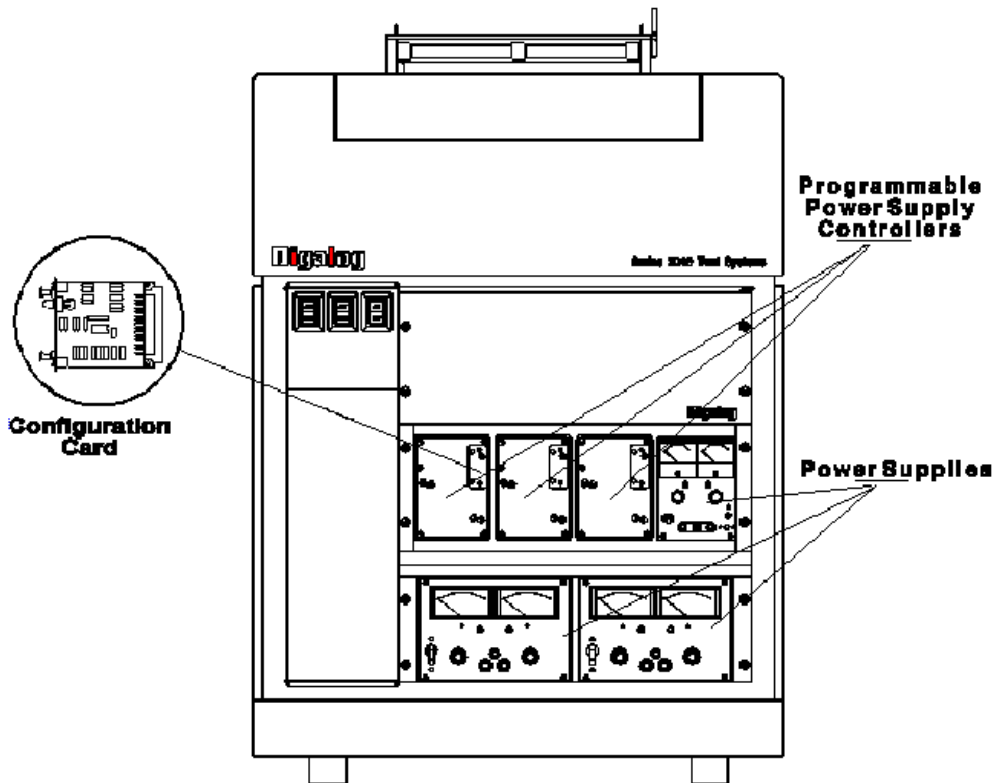


## UUT POWER SUPPLIES - Description

Contained in the middle rack of the unit are the product power supply controllers. Each one controls a single product supply. The controllers are arranged PCS2, PCS1, and PCS0 from left to right. (This is a typical installation. Individual systems may vary.)

To the right of the controllers, PS2, a Kikusui PDA110-1.5L, completes the top power supply rack. Directly beneath, a second rack contains, from left to right, PS1, a Kikusui (or Kenwood) PD-35-20, and a Kikusui PD55-10 (Kenwood PD56-10). The bottom rack is heavy, so care is suggested in handling it.

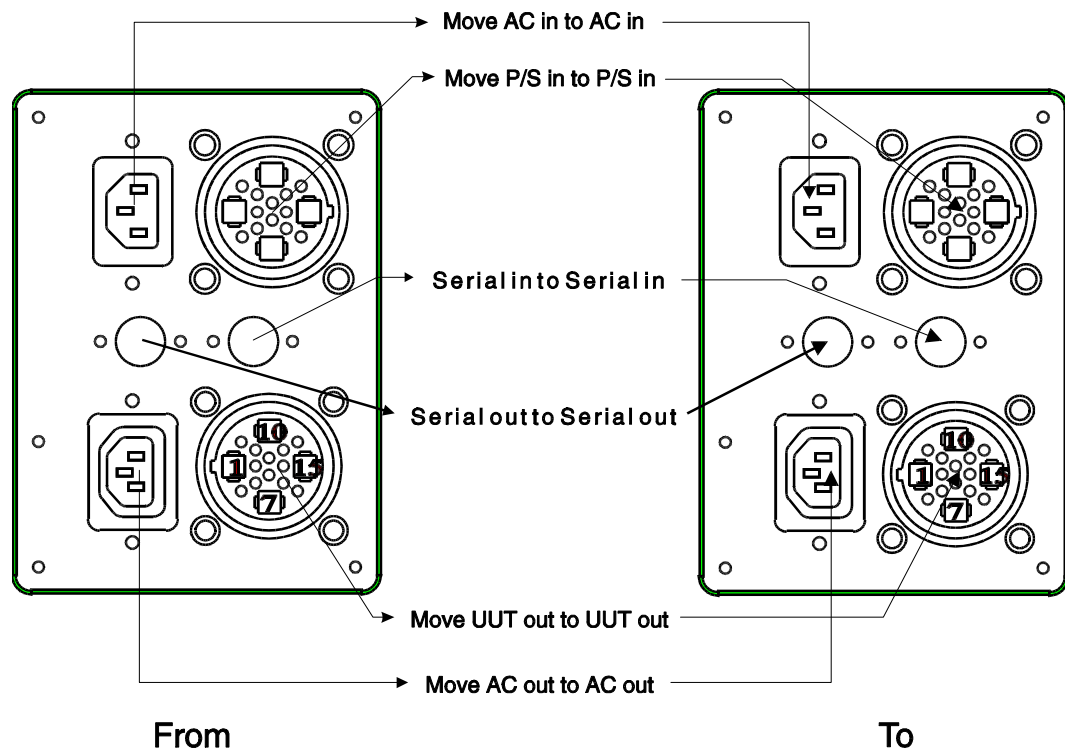
The three power supply controllers are identical. To adapt them to the different characteristics of each supply, a configuration card, unique for each supply, is inserted into the front of each controller. To replace a configuration card, ensure that the power to the controller is shut off, and pull the black tabs and remove the card. To install, reverse the process.



**UUT POWER SUPPLY CONTROLLER REPLACEMENT**

**WARNING! Remove main power from tester before proceeding.**

To remove a controller, remove the upper and lower retaining screws from the front of the console. The controller should slide directly forward. Place the controller to be installed on the floor directly beside the controller being replaced. Place it in the same orientation to make the process simpler. One by one, remove each of the cables/cords from the back of the controller being removed, installing them in the exact same locations on the replacement controller. To reinstall, reverse the removal process.



## UUT POWER SUPPLIES



**WARNING! Remove main power from tester before proceeding.**

The removal process for UUT Power Supplies and GPIB/HPIB Power Supplies is almost identical. However for both types of supplies, extreme caution should be exercised due to the considerable weight of the supplies.

**Lower Rack Power Supplies** (Kikusui or Kenwood PD-35-20, Kikusui PD55-10, and Kenwood PD56-10)

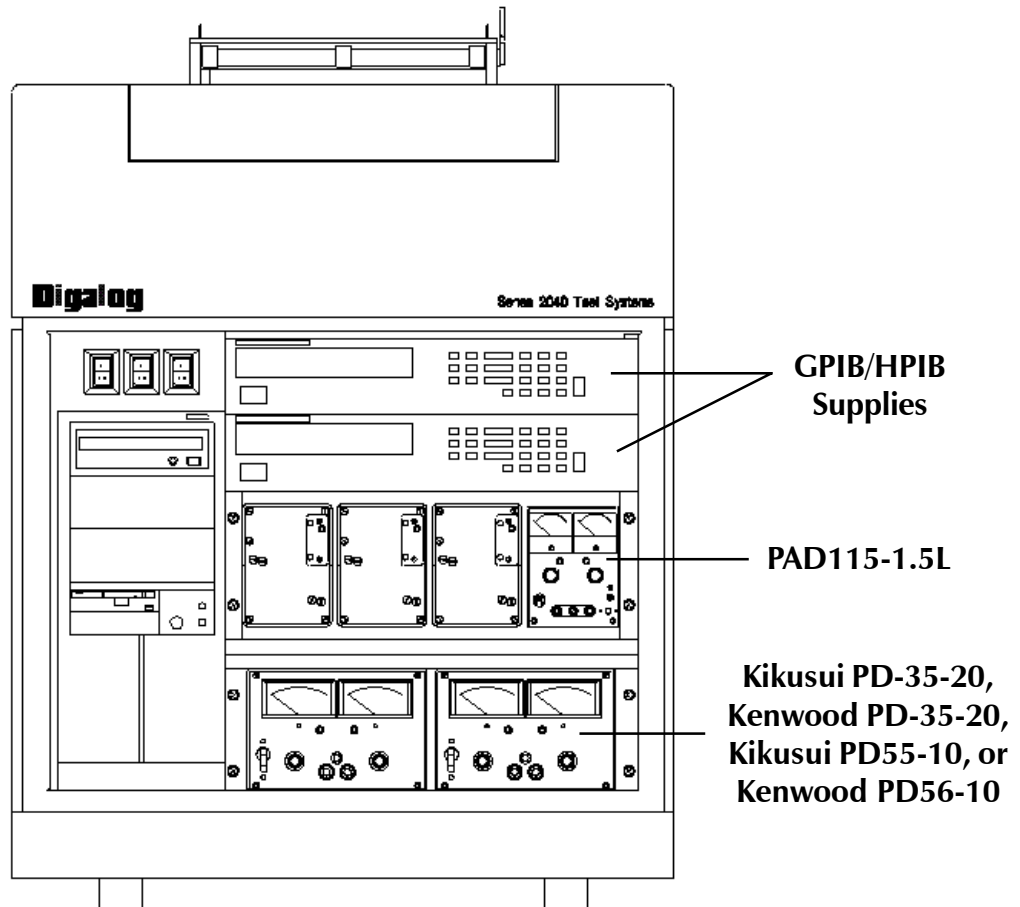
- 1) Remove the left side panel (side opposite the computer) to gain access to the rear of the power supplies.
- 2) Disconnect the AC power cords from the AC/DC Distribution Box, and remove the Power Output/Programming cables from the UUT Controllers.
- 3) Remove the screws in the front panel holding the lower rack in place, and slide the entire rack forward out of the cabinet. The rack assembly is very heavy so proceed with caution.
- 4) Remove the faulty supply from the rack and return for repair.

**Upper Power Supplies** (PDA110-1.5L)

Repeat the above procedure except that the supply can just be removed by removing the small upper and lower retaining brackets. No rack assembly needs to be removed.

## GPIB/HPIB POWER SUPPLIES

- 1) Remove the left side panel (side opposite the computer) to gain access to the rear of the power supplies.
- 2) Disconnect the AC power cords from the AC/DC Distribution Box, and disconnect the GPIB cable, Fault/Inhibit cable, and power output cable from the rear of the supply.
- 3) If the faulty supply is the lower of two GPIB/HPIB supplies, it may be easier to remove the upper supply first.
- 4) Remove the faulty supply and return for repair.



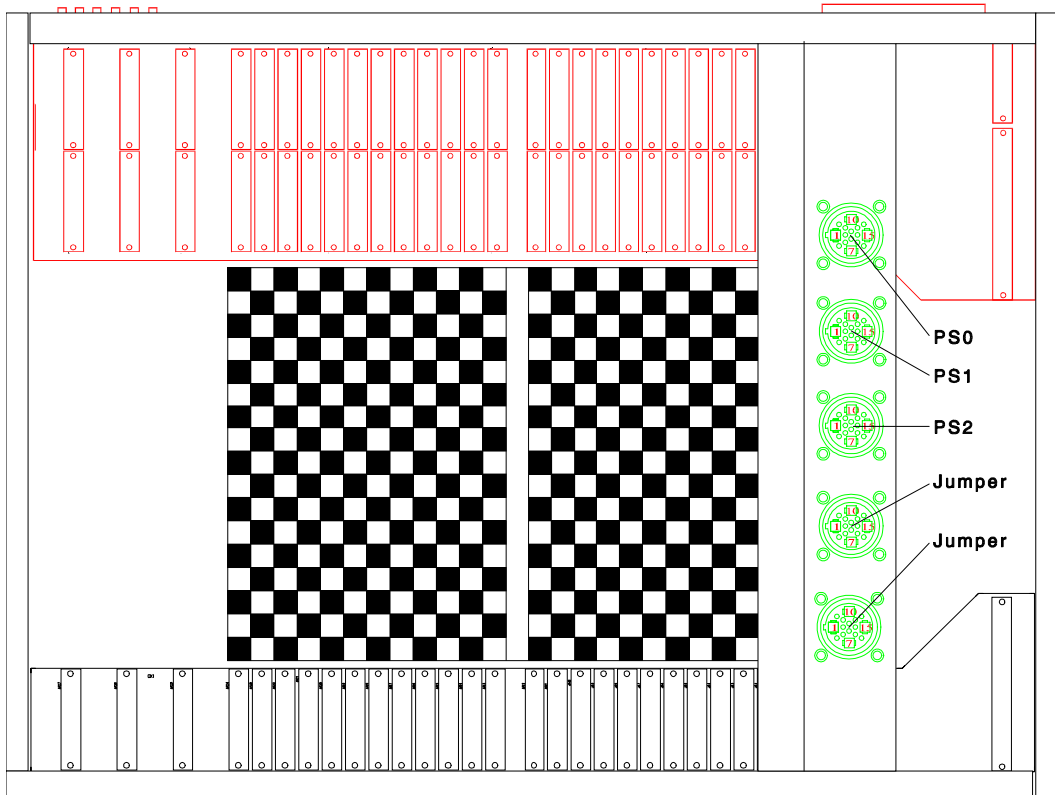
This illustration shows a typical installation. Individual systems may vary from this example.

**UUT - GPIB/HPIB POWER SUPPLY DISCONNECT AT TEST BAY**

From top to bottom:

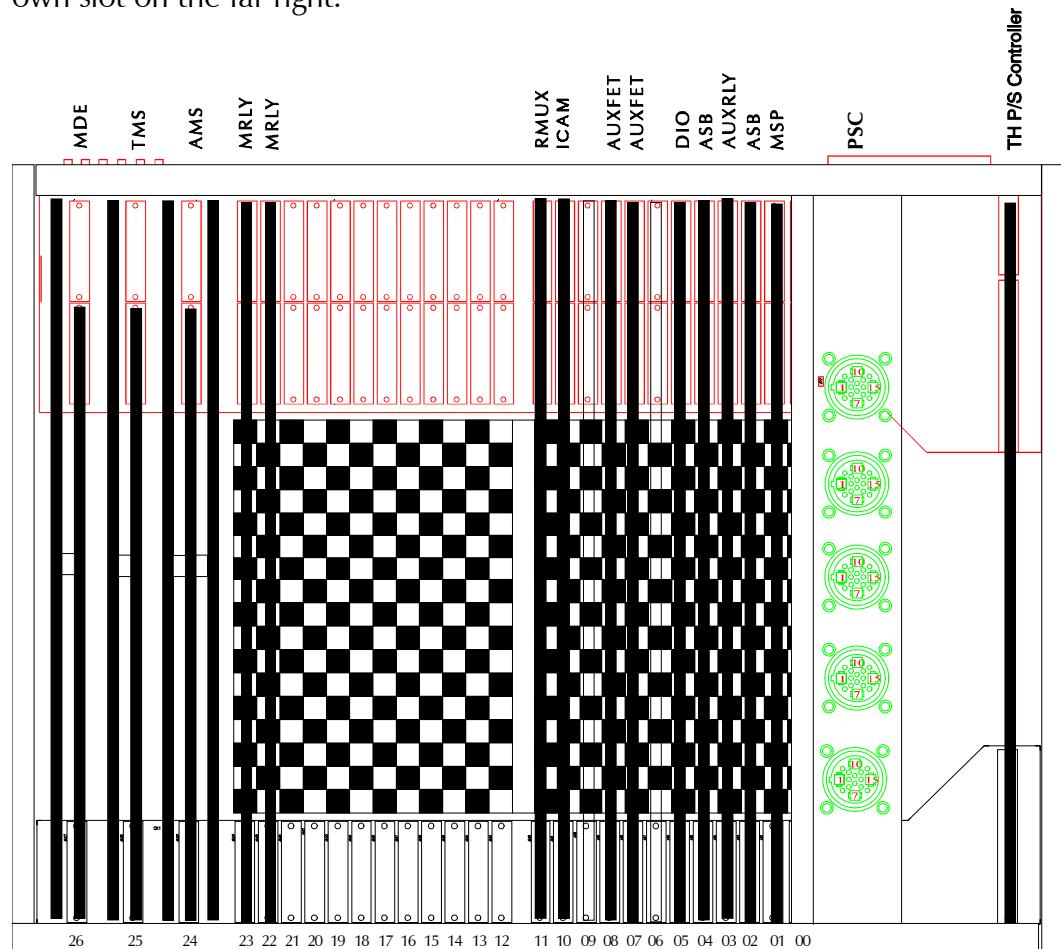
- PS0
- PS1
- PS2
- PS3 - Jumper
- PS4 - Jumper

All unused power supplies must be jumpered. This is a typical installation. Individual systems may vary. Also note, the GPIB/HPIB power supplies may be externally connected to the fixture/UUT.

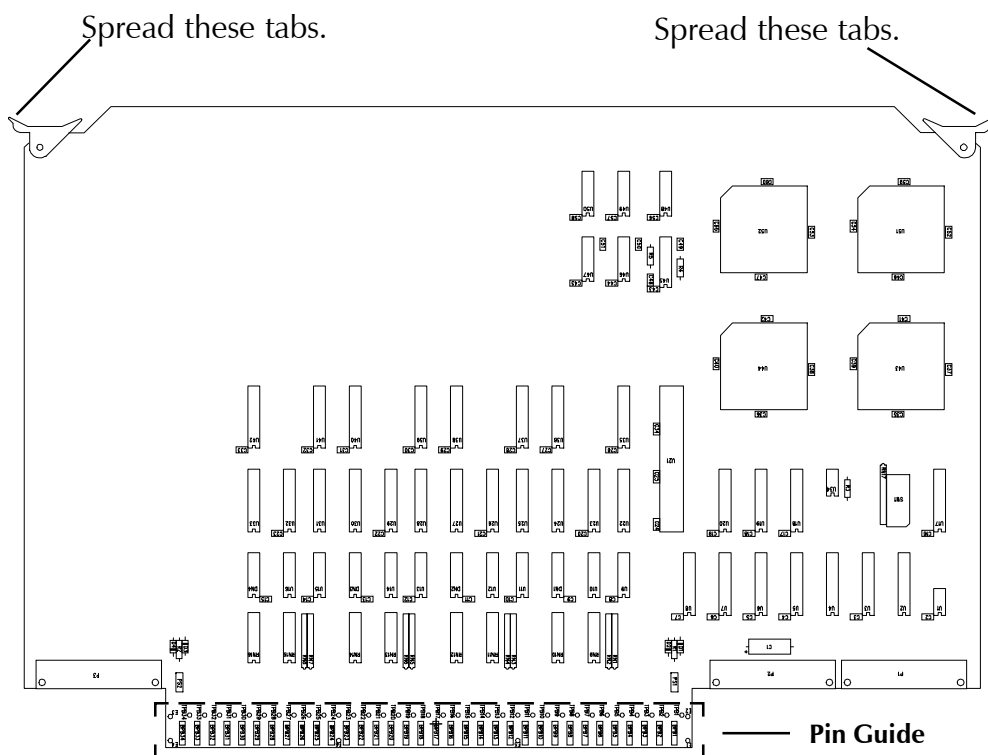


## CIRCUIT BOARD REPLACEMENT

The illustration below shows the positions of the boards in a typical Series 2040 Test System. The MDE, TMS, and AMS are always the last three on the left side of the tester (as viewed from the rear of the Testhead) and are dedicated to those slots shown. The PSD (Power Supply Distribution) assembly always occupies Slot 0, while the PSC (P/S Controller) occupies its own slot on the far right.



To remove a circuit board, grasp the white tabs on the corners of the board and spread them outward towards the sides of the Testhead, as shown on the next page.



To reinstall a board, first check the positioning of the black plastic pin guide to ensure that the beveled openings are aligned with the receptacles on the board. Position the board's leading edge in the top and bottom card guides for the Testhead slot and carefully insert the board until resistance is felt. At this time, it is crucial to ensure that the pointed ends of the Patchboard pins are properly aligned with the receptacles on the board. When the alignment is correct, a slight "give" will be felt as the pins begin to seat. At this point, place your thumbs on the white tabs and firmly seat the board. Ensure that it is fully seated by comparing the position of the rear edge of the board with the rear edge of neighboring boards.

If excessive resistance is encountered or a high pitched metallic noise is heard, stop and remove the board or damage to the pins and/or receptacles may occur. Repeat the procedure from the beginning. In some cases, temporary removal of boards in adjacent slots may be helpful.



## CONTACT SPRING REPAIR

Alignment of the contact springs (pins) in the Patchboard receiver of the Digalog Series 2040 Test System is critical. Misaligned or bent pins can cause failures in the system. It is possible that one or more contact springs may become damaged in one way or another. If the springs are bent, and the bend is horizontal (lateral), the springs may be repairable. If the springs are severely bent, or bent vertically, they must be replaced.

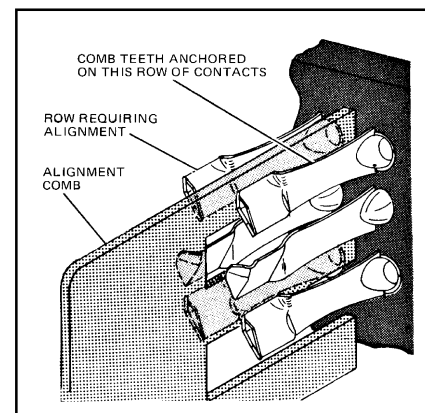
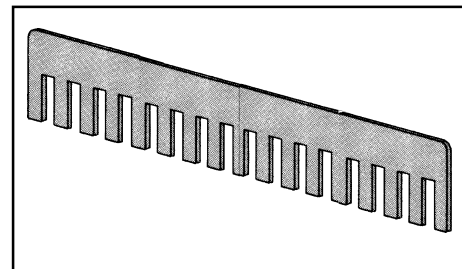
When damage to the springs is minor and repairable, they may be straightened with an Alignment Comb (Digalog part number 0000-2745) designed for this purpose.

When several contact springs of a single row are out of position, straighten them with the alignment comb to attain uniformity. Use the comb as follows:

1. De-energize the system, and remove the Patchboard fixture to expose the contact springs.
2. Determine the contact springs to be straightened. You can do this by placing a non-metallic straight edge vertically along the row to be straightened.

**CAUTION: Be sure the contact springs you are aligning are either all left hand or all right hand springs.**

3. Place the bottom edge of the teeth of the comb between two vertical rows of contact springs.
4. Place the bottom edge of the teeth against the base of the contact springs in the row adjacent to those being straightened.
5. Push against the top of the contact springs with the comb. It may be necessary to bend the contact springs beyond the normal



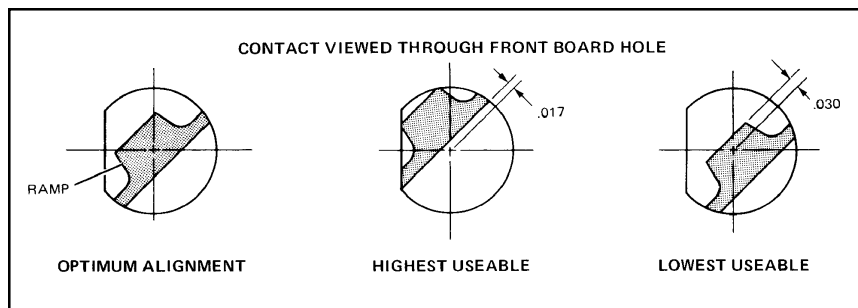


position to ensure that they all have the proper spring tension. If so, you must then place the comb on the opposite side of the contact springs and bend them back to the normal position.

Individual contact springs can be aligned using a suitable non-metallic tool (e.g. the eraser end of a pencil). Simply reposition the bent contact spring so that it is aligned with the properly positioned springs in the same row.

Alignment of the contact springs can be visually checked by looking straight through the holes of an empty Patchboard with the Patchboard in operating position. When making such a visual check, be sure that the contact springs are positioned within the range shown.

If a contact spring is severely bent, or bent vertically, replacement of the contact spring is recommended. Should the bend be minor and in the horizontal (lateral) plane, the contact spring may be repairable.

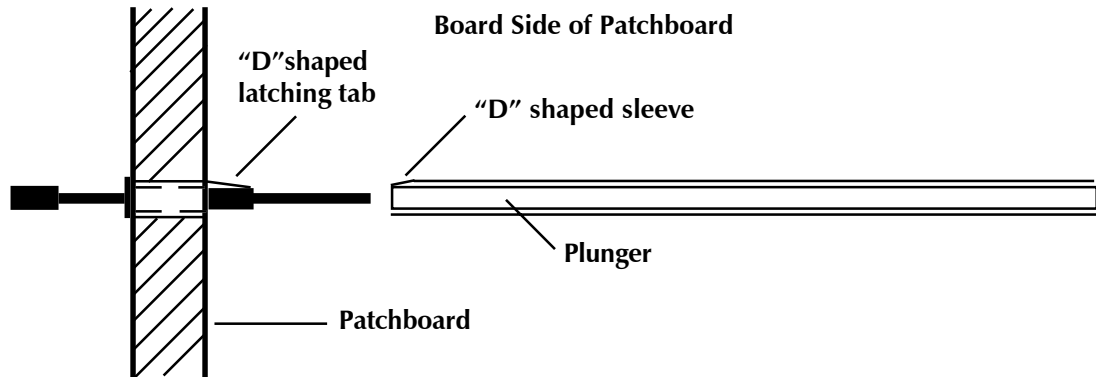


### USE OF PATCHBOARD SPRING REMOVAL TOOL (0000-2746)

Determine the slot in which the damaged spring is located. If there is a Testhead card in that slot, it will need to be removed. Be sure to use a wrist strap when removing or inserting the card, and be sure to place the card into a static bag while it is out of the tester.

Turn off Testhead power and open the Testhead. Remove the card if necessary, put it into a static bag and set it safely aside. Determine the location of the damaged spring. Observe on the top (fixture mating) side of the Testhead that each spring has a pair of small metal tangs at the base, opposite the "finger" of the spring. The latching tab on the bottom (Testhead card) side is on the same side of the spring as the tangs.

Retract the plunger of the spring removal tool and position the sleeve of the tool so that the flat side of the "D"-shape formed by the end of the sleeve is aligned with the latching tab of the damaged Patchboard spring (Testhead card



side of the Patchboard). Carefully lower the sleeve over the spring until it is fully seated and the sleeve is resting against the Patchboard. The "stinger" of the spring will slide into the hollow end of the plunger. A flashlight may be needed to provide adequate lighting, especially if there are Testhead cards on either side of the slot. The latching tab of the spring should be fully depressed inside the tool sleeve.

Be sure that the tool is held straight in-line with the spring. Apply steady, careful pressure on the handle. Do NOT push sharply and do NOT strike or tap the end of the handle. Resistance will be felt as the spring slides out of the Patchboard. Continue to apply steady pressure until the plunger handle bottoms out. If these precautions are ignored, it is possible to damage the tool or the Patchboard material itself.

The ejected Patchboard spring will be protruding from the top (fixture mating) side of the Patchboard. Simply grasp it and pull it free of the Patchboard.

After replacing the spring in the Patchboard, re-install the Testhead card and close the Testhead.

### CONTACT SPRING REPLACEMENT (Conventional Method)

To remove a damaged contact spring when the removal tool is not available, use the following procedure:

1. Remove the termination from the rear of the spring. (Remove the Testhead card.)
2. With a slow and steady pressure, bend the one side of the "U" in far enough to clear the board opening. Then, in the same manner, bend the other side of the "U" in far enough to permit the contact spring to pass freely through the board cavity.

**CAUTION: To prevent chipping of the cavity, double check that the "U" will clear the cavity opening.**

3. Face the front of the board, and grasp the damaged contact spring across the chevron with a needle-nosed pliers. With a steady, even pressure, pull straight out on the contact spring until it is free and clear of the board - and then destroy the contact spring *immediately!*

To install a new contact spring in the board, the following steps are recommended:

1. Be sure that you have the proper contact spring, right hand or left hand, whichever is required (the chevron contact area should be facing the general direction of the bottom left or bottom right corner of the frame).
2. The Digalog part numbers for the springs are as follows:  
  
Right Hand: 2825-1011  
Left Hand: 2825-1012
3. Orient and start the contact spring by hand, according to the position of the "D" within the board cavity.
4. Place the end of a medium size screwdriver against the end of the barrel, at the base of the blade. Then press with a slow and even pressure until the "ears" are seated on the board. As the "ears" reach the surface of the board, you will feel the locking tab snap into the locked position.
5. Check the replacement contact spring to see that it is properly aligned with the adjacent springs.

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