

ADJUSTMENT

Introduction

This adjustment procedure is to be used to restore the DC 503 to original performance specifications. Adjustment need not be performed unless the instrument fails to meet the Performance Requirements of the Electrical Characteristics listed in the Specification section, or the Performance Check cannot be completed satisfactorily.

Completion of all adjustment steps in this procedure ensures that the instrument will meet the performance requirements listed in the Specification section. However, to fully ensure satisfactory performance, it is recommended that the Performance Check be performed after any adjustment is made.

Services Available

Tektronix, Inc. provides complete instrument repair and adjustment at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

Test Equipment Required

The test equipment listed in Table 3-1, or equivalent, is required for adjustment of the DC 503. Specifications given for the test equipment are the minimum necessary for accurate adjustment and measurement. All test equipment is assumed to be correctly calibrated and operating within specification.

If other test equipment is substituted, control settings or calibration setup may need to be altered to meet the requirements of the equipment used.

A flexible plug-in extender, Tektronix Part No. 067-0645-02, is useful for troubleshooting or adjusting the DC 503; however, the complete Adjustment Procedure can be performed without use of the extender.

Table 3-1

LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Application	Example
Oscilloscope and 100X Probe	Step response time of oscilloscope/probe combination must be ≤ 2 ns.	Adjusting step response and setting time base on frequency.	TEKTRONIX 5440 mainframe and 5A38/5B40 with a TEKTRONIX P6057 100X probe for real time, and a TEKTRONIX 5S14N Sampling Unit for checking signals with ≤ 2 ns risetime. (Real-time oscilloscope/probe combinations with response time ≤ 2 ns may be used, so long as probe input impedance is ≥ 5 k Ω paralleled by ≤ 5 pF.)
Pulse Generator	Output ≥ 0.5 V square wave with risetime ≤ 1 ns.	Adjusting step response.	TEKTRONIX PG 502 in a TM 500-Series Power Module.
Power Module	Three compartments or more.	All tests.	TEKTRONIX TM 503 or TM 504.
Voltmeter	Accurate within 1%, range 0 to 50 volts dc.	Check and adjust power supply voltage.	TEKTRONIX DM 501 or equivalent.

Table 3-1 (cont)

LIST OF TEST EQUIPMENT REQUIREMENTS

Description	Performance Requirements	Application	Example
10X Probe	At least 1 M Ω input resistance paralleled by \leq 30 pF.	Checking and setting time base frequency.	TEKTRONIX P6006, P6060, or equivalent.
50- Ω Feedthrough Termination	Bnc connectors.	Step response adjustment.	Tektronix 011-0049-01 or equivalent.
50- Ω Coaxial Cable (2 ea)	Bnc connectors.	Checking and setting time base frequency and step response.	Tektronix 012-0057-01 or equivalent.
Bnc 'T' Connector		Adjust step response.	Tektronix 103-0030-00 or equivalent.
Frequency Standard*	Output 1 V or more into 50 Ω load, accurate within 1 part in 10 ⁸ , output frequencies to include 1 MHz.	Adjust time base.	WWV.

*Traceable to NBS.

Preparation

a. Remove the left side cover of the DC 503 to gain access to the adjustments inside. Remove the cover by pulling the rear end outward from the side of the instrument (the cover snaps into place).

b. Connect the DC 503 to the power module by means of the flexible plug-in extender. If an extender is not available, remove the cover from the power module and plug the DC 503 into the left compartment.

c. Be sure that the power switch on the power module is off. Set the power module for the line voltage to be applied (see power module manual).

d. Plug the power cord of the power module into the power source to be used and turn on the power module.

e. Connect all test equipment to a suitable line voltage source. Turn on all test equipment and allow at least 20 minutes for the equipment to warm up and stabilize.

Initial Control Settings

Set the following controls during warm-up time:

DC 503

FUNCTION	.01 s
CLOCK RATE	10 ⁶ —1 s
DISPLAY TIME	ccw
CH A LEVEL	midrange/in
CH B LEVEL	midrange/in
All front-panel pushbuttons	out

DM 501

Range/Function switch 20 DC Volts

1. Adjust +15 V Supply

a. Connect the DM 501 LO test lead to the DC 503 chassis ground (function of C502 and R506). Connect the DM 501 HI test lead to the DC 503 +15 V test point (the junction of R502, C502, and R504, see Fig. 3-1).

b. Adjust R505 for a reading of +15.000 on the DM 501 readout.

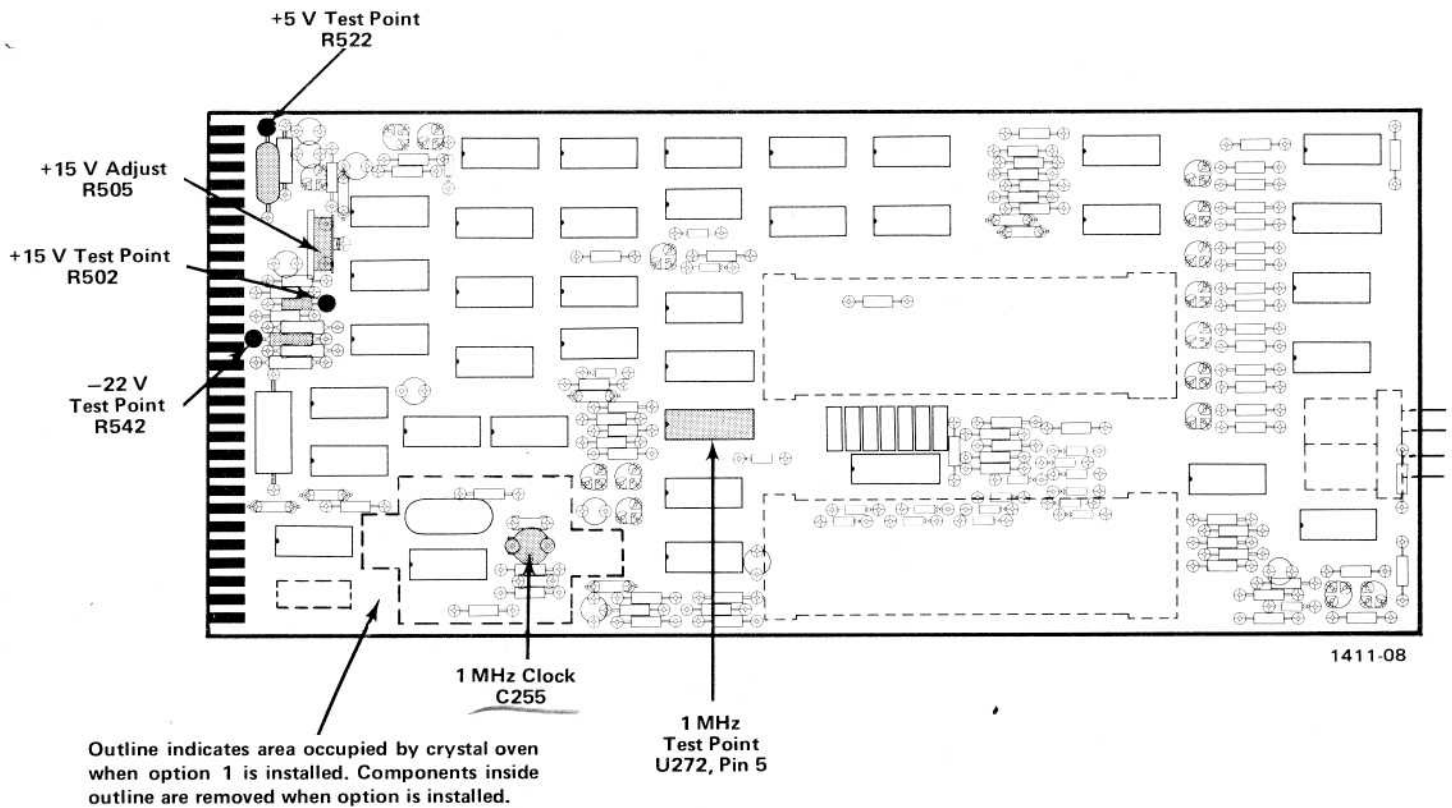


Fig. 3-1. Location of power supply test points and adjustment.

c. Check that the +5 V and -22 V supplies are both within $\pm 5\%$ of their specified outputs.

2. Adjust CH A Level Balance, R42

a. Remove any cables connected to the DC 503 front-panel input connectors.

b. Set the DC 503 FUNCTION switch to TOTALIZE A.

c. Press the DC 503 Totalize START/STOP (in for start, out for stop) pushbutton. Release all other pushbuttons.

d. Turn the CH A LEVEL control to its mechanical center (midscale).

e. Turn Level Bal control R42 (see Fig. 3-2) extreme clockwise.

f. Press the RESET pushbutton.

g. Turn R42 slowly counterclockwise while watching the display readout. The instant that the readout changes from 0 to 1, stop turning R42; the change indicates R42 has reached its correct setting.

h. Repeat this step a few times until you are confident that R42 is adjusted as directed.

3. Adjust CH B Level Balance, R142

a. Set the DC 503 FUNCTION switch to PERIOD B. Set the CLOCK RATE switch to $1-1 \mu\text{s}$ (extreme counterclockwise). Release the Totalize START/STOP pushbutton.

b. Set the CH B LEVEL control to its mechanical center (midscale). Turn CH B Level Bal control R142 (see Fig. 3-2) to its extreme counterclockwise position.

c. Press the RESET pushbutton, then turn R142 slowly clockwise. The instant that the GATE lamp illuminates, stop turning R142; the correct setting of R142 causes the GATE lamp to illuminate.

d. Repeat this step a few times until you are confident that R142 is adjusted as directed.

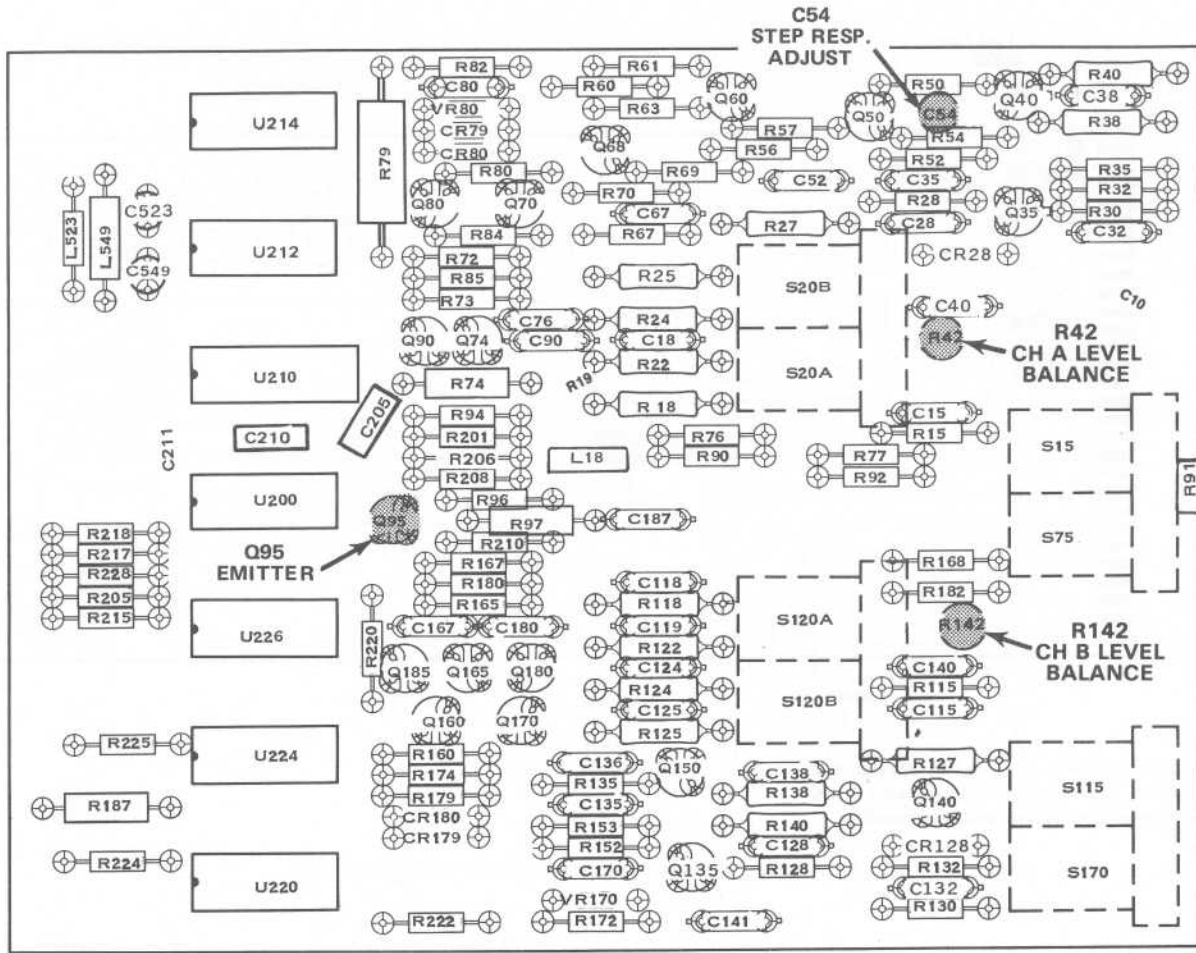


Fig. 3-2. Location of Level Balance and Step Response adjustments.

4. Adjust Time Base Frequency

Control Settings:

Test Oscilloscope

Volts/Div	1 V
Coupling	ac
Time/Div	.2 μ s
Trigger Source	external

DC 503

FUNCTION	.1 s
CH A LEVEL	midrange
DISPLAY TIME	ccw
CH A AC COUPL	
pushbutton	in
All other pushbuttons	out

a. Connect a 10X probe from the vertical input of the test oscilloscope to pin 5 of U272 in the DC 503 (see Figs. 3-1 and 3-3).

b. Connect a 'T' connector to the output of the frequency standard. Connect a 50 Ω coaxial cable from one end of the 'T' connector to the external trigger input of the test oscilloscope. Connect the other end of the 'T' connector through a 50 Ω coaxial cable to the CH A INPUT of the DC 503.

c. Adjust the test oscilloscope triggering controls for stable triggering on the frequency standard signal. Adjust the DC 503 CH A LEVEL control for a stable readout display.

d. Adjust—capacitor C255 in the DC 503 (see Fig. 3-2) for minimum pulse drift across the screen of the test oscilloscope. At the conclusion of the adjustment, the drift should not exceed 1 division per second.

NOTE

The adjustment procedure for Option 1 instruments is the same except that the drift should be set for no more than 5 divisions drift in 20 seconds (5 parts in 10^7). The adjustment is located under the slotted plastic cover on the crystal oven.

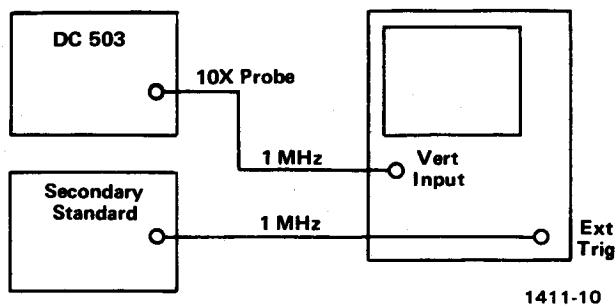


Fig. 3-3. Connections for Time Base frequency check.

- e. Set the DC 503 FUNCTION switch to 10 s.
- f. Check—that the DC 503 readout display is 000.0000 ± 100 counts (999.9900 to 000.0100).

NOTE

For Option 1, the DC 503 readout should display 000.0000 (display flashing) ± 5 counts (999.9995 to 000.0005).

5. Adjust Channel A Step Response

a. Install the sampling unit into the test oscilloscope (a real-time oscilloscope/probe combination may be used for this step, providing the risetime of the combination is ≤ 2 ns).

b. Connect a 100X probe (P6057) from the emitter of Q95 (see Fig. 3-2) in the DC 503 to the CH 1 input of the sampling unit; connect the probe ground clip to chassis ground of the DC 503.

c. Set the fast-rise pulse generator for ≈ 1 volt output and connect it to the DC 503 CH A INPUT via a 50 Ω coaxial cable and a 50 Ω termination.

d. Obtain a test oscilloscope display of the waveform at the emitter of Q95. Set the test oscilloscope vertical deflection controls to give 5 major divisions of waveform display.

e. Adjust C54 in the DC 503 for the best front corner on the waveform. Aberrations on the front corner should not exceed 1 major division ($\pm 20\%$).

This concludes the adjustment procedure for the DC 503.