Trig-Tek™

500AT
Digital Analyzer
User Manual

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Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.

This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.

Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.

Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.

2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until performance is checked by qualified personnel.

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DOCUMENT CHANGE HISTORY

Revision	Date	Description of Change
A	2/11/2011	Document Control release

Chapter 1
Introduction

The Trig-Tek 500AT Digital Analyzer, **Figure 1-1**, is designed to provide amplitude, frequency, and phase information obtained from a complex wave form as may be encountered at sensors used to measure vibration.

The block diagram, **Figure 1-2**, shows the basic system configuration. The analyzer is comprised of two main parts: the Carrier Generator and the Data Channel. In the following sections, the function of each is given and then the system operation is described.

Figure 1-1, 500AT Digital Analyzer

Digital Carrier Generator

The Digital Carrier Generator provides the means to lock on and track the Reference Input signal. The lock-on is accomplished by a Discriminator circuit, which senses whether the reference signal frequency is higher or lower than the VCO (voltage controlled oscillator) frequency, and then generates a voltage of the proper polarity to cause the VCO frequency to move toward the reference signal frequency. When the VCO frequency is within plus or minus one Hz of the reference frequency, the Discriminator circuit becomes a Phase Detector with a plus to minus DC voltage output for a +360° to -360° phase shift between the VCO signal and the reference signal. This phase-sensitive voltage phase locks the VCO signal to the reference signal.

Between the VCO and the Phase Detector is a Divider which provides the address signal to the Sine and Cosine Read-Only-Memories (ROM), and also provides multiplied signals for the Frequency Counter and the Frequency to DC Converter. The Sine and Cosine ROMs each have eight lines of data output which are the

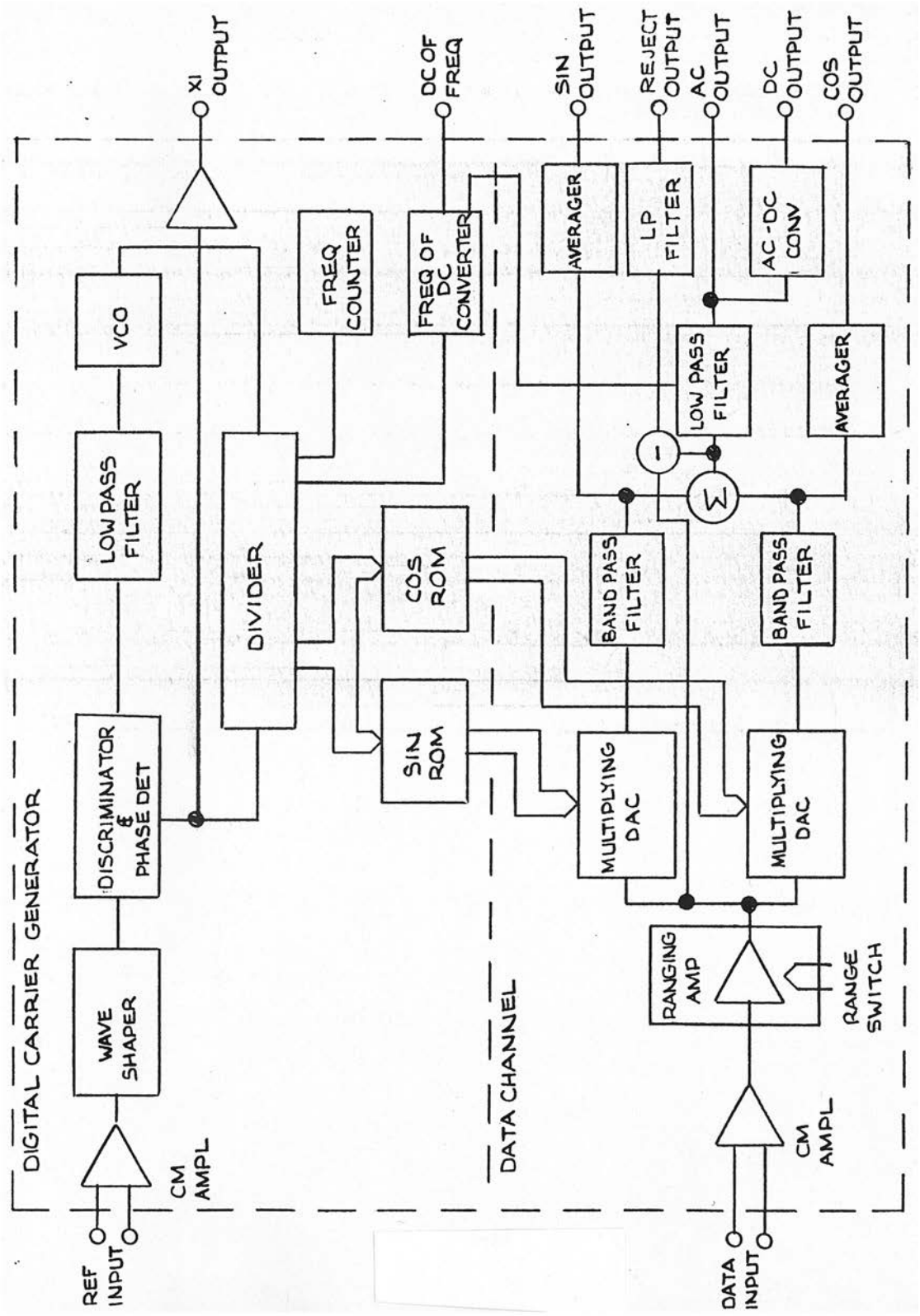

Figure 1-2, System Block Diagram 500AT

digital representation of the Sine and Cosine of the reference signal. These two digital signals are used by the Data Channel as the (carrier) heterodyne input.

Data Channel

The Data input signal to the Data Channel is first amplified by the Ranging Amplifier providing five full-scale range settings of 0.1, 0.3, 1.0, 3.0 or 10 Volts. The signal, after ranging, is multiplied with the digital sine and cosine signals from the Carrier Generator in the M/DAC (Multiplying Digital to Analog Converters). The outputs of the M/DACs are the sum and difference products of the Data Input signal mixed with the digital sine and cosine (carrier) signals. The difference products are passed by the Low Pass Filters, and the sum products are filtered out. The filtered signals are averaged and brought out at the SIN and COS outputs. The two Low Pass filter outputs are also the inputs to the Summing Network, which uses the sine and cosine information to derive the AC and DC level outputs.

System Description

The carrier generator locks onto the signal at the REF Input and supplies the DC of Frequencies output and the digital indication of frequency in Hz with 0.1 Hz resolution in 0.667 second update time, or of speed in RPM to 10 RPM resolution in 0.75 second update time. The X1 output is a constant level square wave, the same frequency as the REF input. The signal at the reference input can vary within the constraints shown in the specification; and the amplitude and frequency information will be correctly indicated at the digital indicators and also at the outputs.

When phase information is to be used from the SIN and COS outputs, it must be noted that the phase reference is established by the positive going crossing of the reference input signal. The wave shaper, in series with the reference input and the carrier generator, incorporates hysteresis, causing a phase error if a sine wave is used. Also, the amount of the phase error may vary with a large amplitude change of the sine wave signal. It is recommended that a square wave, or a pulse with not less than 50 microsecond duration, be used as the reference input signal to overcome the phase error caused by the hysteresis. The voltages of the COS and SIN outputs (see **Figure 1-3**) are the rectangular coordinates of a vector. The length represents the amplitude of the Data signal and the Reference signal. The COS output is x, where $X=\sqrt{r^2 - y^2}$, and r is the amplitude with a length of 10 V for any full-scale setting of the RANGE switch. The SIN output is y, where $Y=\sqrt{r^2 - x^2}$.

Thus, where the two voltages are plotted on an x-y recorder, the output is a vector, where the length from the center is the amplitude of the Data signal, and a line drawn through the point and the center projects the angle phase, which is the phase relation between the Reference signal and the Data signal.

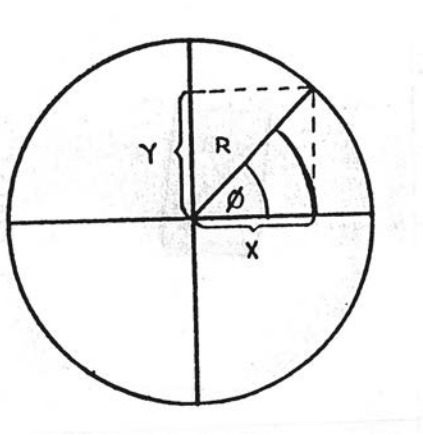

Figure 1-3, Phase Diagram

Diagram **Figure 1-4** shows the COS and SIN outputs for the different phase relationships between the Data and the Reference signals.

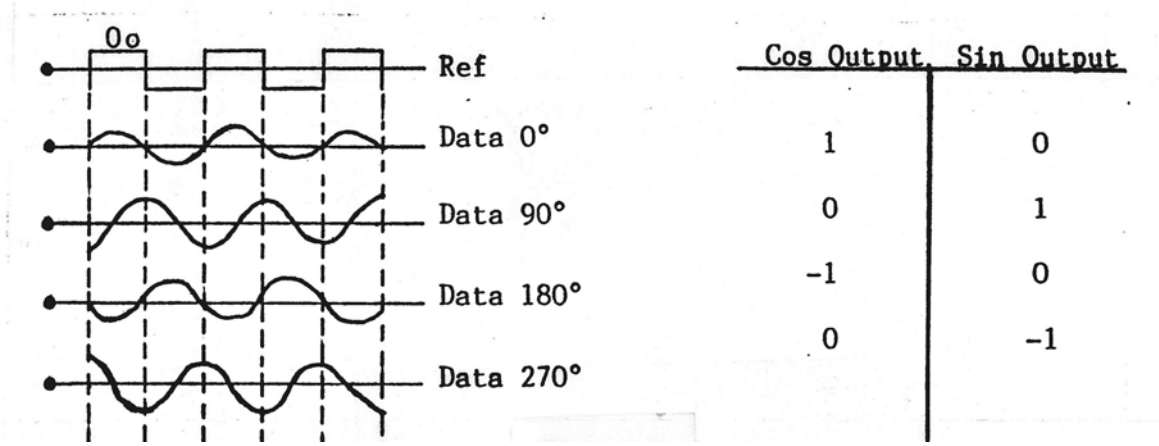

Figure 1-4, COS and SIN Outputs

Diagram **Figure 1-5** shows the recommended connection to plot phase and amplitude, using an X-Y plotter.

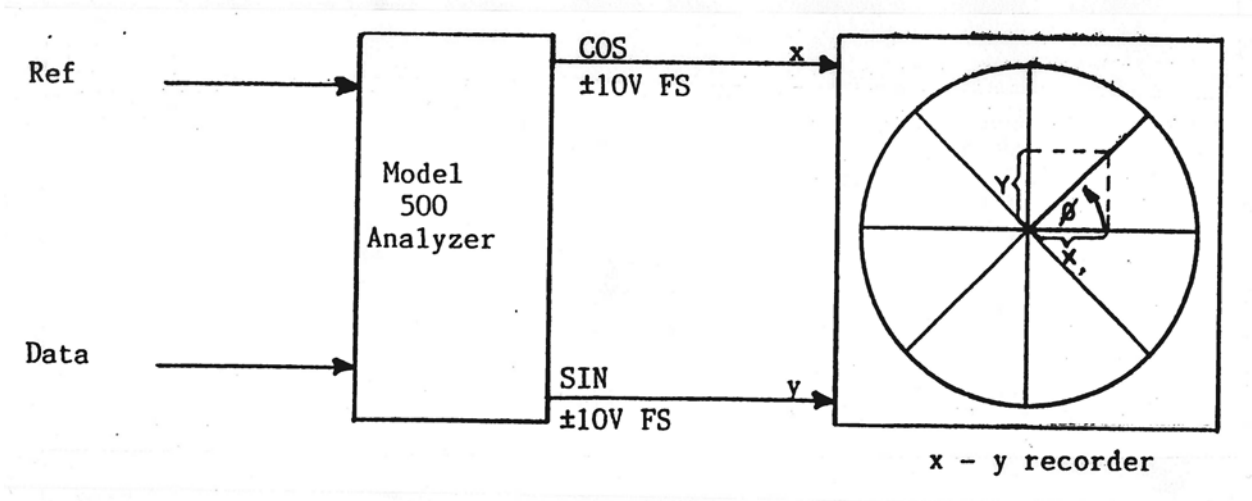

Figure 1-5, Connection with X-Y Plotter

Specifications

Data Input

Frequency	5 Hz to 5 kHz
Level	0 to 10 Volts RMS input guarded up to 150 Volts RMS
Impedance	300 K Ohms
Common Mode Rejection	Greater than 40 dB at 60 Hz
Connector	BNC

Reference Input

Frequency	5 Hz to 5 kHz.
Level	10 mV rms to 20 Volts RMS input guarded up to 150 V RMS
Impedance	300 K Ohms
Waveform	Sine, Square, Pulse (20 µsec. or wider or Triangle)
Common Mode Rejection	Greater than 40 dB at 60 Hz
Connector	BNC

LIN DC of Frequency Outputs

Level	5 Volts at 5,000 Hz
Accuracy	0.5% of indicated plus 0.1 % of full scale
Impedance	Less than 50 Ohms (5 mA)
Response Time	100 milliseconds
Connector	BNC

LOG DC of Frequency Output

Level	0 to 1 Volt
Impedance	Less than 50 Ohms
Conformity	±0.5 dB
Connector	BNC

LIN DC of Level Output

Level	10 Volts full scale
Accuracy	2% of indicated plus 0.2% of full scale
Impedance	Less than 50 Ohms (5 mA)
Bandwidth	Bandpass - Three selectable (four pole Bessel) filter bandwidths of 1.5, 5, or 15 Hz. Wideband - 10 KHz bandwidth. Low Pass - Three times the tuning frequency.
Connector	BNC

LOG DC of Level Output

Level	0 to 1 Volt
Impedance	Less than 50 Ohms
Conformity	±0.5 dB
Connector	BNC

Cosine and Sine Outputs

Quadrature	90˚ ±0.5˚ between Sine and Cosine
Accuracy	±1% of reading ±0.2% of full scale
Level	±10 Volts full scale
Impedance	Less than 50 Ohms (5 mA)
Offset (zero input, 100 Hz)	0 ±10 mV
Differential Phase Shift Between Reference and Data Inputs	±2% from 10 Hz to 3000 Hz
Connectors	BNC

Indicators

OL (Overload)	Red light illuminates if input to filter or output of filter is too high.
Level (Analog meter)	Small meter providing course amplitude of signal. Allows operator to observe signals moving into and out of filter.
Level (Digital meter)	Digital panel meter indicating the level of the filter signal in either Volts or g's.
RPM-Hz Counter	Digital counter providing six-digit indication of RPM, or five-digit indication of Hz.
PK LED	Illuminates when the PK units are selected by the rear panel UNITS switch.
RMS LED	Illuminates when the RMS units are selected by the rear panel UNITS switch.
PK-PK LED	Illuminates when the PK-PK units are selected by the rear panel UNITS switch.

Controls

POWER switch	Turns power ON and OFF.
TUNING MODE switch	
Auto	Analyzer functions as a tracking filter and will automatically acquire and track the signal at the Reference Input.
Manual	Analyzer must be manually tuned by means of the Tuning Control.
Sweep	Analyzer will sweep upward at the rate set in by the sweep rate control. It will start at the frequency set in by the manual tuning control.
SWEEP HOLD switch	This switch, when in the HOLD position, will stop the sweep and hold at the frequency when selected.
Full-Scale RANGE switch	
100 mV, 300 mV, 1 V, 3 V, 10V	Provides for full-scale digital meter readings as indicated in Volts.
10 g, 30 g, 100 g, 300 g, 1000 g	Provides for full-scale digital meter readings as indicated in g's (100 mV/g sensitivity).
Calib	CALIB position of Range switch connects the Data Input to the calibrator for setting the Analyzer gain to10.00 g full scale, using the CALIB SET control.
RPM-Hz switch	
RPM	Sets the counter to indicate from 0 to 300,000 RPM.
Hz	Sets the counter to indicate in Hz with 0.1 Hz resolution from 0 to 5000.0 Hz.
Tuning	Ten-turn pot, allowing operator to manually tune the analyzer from 3 Hz to 5,000 Hz.
Current Set	A screwdriver adjustment to set the current output when the mV/g input is in use.

Dimensions

19" wide x 3.5" high x 12" deep.

Power

120 VAC, 50-400 Hz, 10 watts.

Weight

15 lbs. (33 kgms).

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Chapter 2
Operation

The 500AT Digital Analyzer provides a means of measuring the independent frequency components of a complex signal and displays the frequency and amplitude of each component on digital meters.

The unit provides three modes of operation: MANUAL, SWEEP, or AUTO. In the MANUAL mode, the frequency spectrum can be scanned using a MANUAL TUNE control, and the amplitude of each frequency component can be read on the level meter.

The unit also provides DC of Frequency and Level outputs, which can be used to make XY plots of level versus frequency. This is especially useful in the SWEEP mode, where the frequency spectrum is scanned automatically.

The third mode, called AUTO, provides a means to lock the unit to a reference frequency, which provides the tuning position of the bandpass filter. As the frequency of the reference input varies, the bandpass center frequency follows it.

The following procedure describes each of the controls used to implement these three modes of operation.

WARNING

Before connecting the 500AT to a power outlet, verify that the unit is set for the voltage to be used. Switch S1 on the main board is provided to connect the primary of the transformer for either 110 or 220 VAC operation. Be sure the unit is not plugged into 220 VAC when the switch is set to 110, as damage may be done to the unit. With this switch set properly, turn the POWER switch to POWER.

Units Switch (Rear Panel)

The UNITS switch has three positions to select, PK, RMS, or PK/PK units at the input. The selected units will also light a LED on the front panel to provide the operator with the information as to which units were selected. This switch should be set to the appropriate units to accommodate the measurement being made. The level meter FULL-SCALE RANGE switch is calibrated in the units selected by this switch.

Reference DIFF-SE Switch (Rear Panel)

The reference input has an insulated BNC connector to provide a differential input when the reference DIFF-SE switch is in the DIFF position. When the switch is placed to the SE (single-ended) position, the common side of the reference input jack is connected to signal ground for single-ended operation.

Data Input Mode Switch (Rear Panel)

The Data Input Mode switch has three positions: SE (single-ended), DIFF (differential), or CURR (current). The SE position connects the common side of the data input jack to signal ground for single-ended operation. The DIFF position removes the ground from the common of the data input jack, and allows for differential operation. The CURR position is used when operating with an accelerometer or other type pickup that has built-in electronics requiring a constant current. When in the CURR mode, the CURR SET control provides a means of setting the constant current output for 0.5 to 10 milliamps.

Mode Switch

This switch has three positions: MANUAL, SWEEP, and AUTO. The MANUAL position connects the MANUAL TUNE control in the circuitry, so the frequency spectrum can be scanned. The frequency will vary from 2.5 Hz to 5000 Hz as the MANUAL TUNE control is turned clockwise. When the MODE switch is placed to SWEEP, and the SWEEP START/STOP switch is placed to START, the frequency will sweep up at a linear rate from the point preset by the MANUAL TUNE control; thus, one would first set in the lowest frequency required, and sweep from that point upward in frequency.

The rate of sweep can be varied by the SWEEP RATE control. When this control is turned clockwise, the sweep rate will increase, and when turned counterclockwise, it will decrease. When the MODE switch is placed to the AUTO position, a frequency at the REF INPUT jack is required; the unit will automatically lock onto the reference signal and follow it as its frequency changes. When a proper signal is at the REF INPUT jack, the lock light will illuminate, and the frequency speed counter will indicate frequency.

Units Switch

The UNITS switch for the frequency speed counter selects either Hz or RPM as the units indicated on the counter.

Meter Input Switch

The METER INPUT switch has three major functions, BANDPASS, WIDEBAND, and LOW PASS. Under the heading of BANDPASS are AMPL, SIN, and COS. When in the BANDPASS mode, and with the AMPL positions selected, the level meter indicates the overall amplitude of the bandpass filter. When the SIN or COS modes are selected, the meter reads the rectangular coordinance of the amplitude vector. In the WIDEBAND position the level meter reads the RMS value of the wideband signal fkom 5 Hz to 7.5 KHz. When the LOW PASS position is selected, the meter indicates the rms value of the signal components from 5 Hz to two times the tuning frequency.

BW Hz Switch

The BW Hz switch has three positions marked LOW, MEDIUM, and HIGH. When the BANDPASS positions of the meter input switch are selected, the BW Hz switch is in the circuit. The LOW position is nominally set for 1.5 Hz, the MEDIUM for 5 Hz, and the HIGH for 15 Hz.

Full Scale Range Switch

The FULL SCALE RANGE switch selects five ranges for ACCEL or five ranges for VOLTS as the input parameter. When the ACCEL parameter is selected, l0, 30, 100, 300, or 1000 g's FS can be selected. The input is calibrated for 10mV/g PK, PK-PK, or RMS as selected by the rear panel UNITS switch. When the VOLTS parameter is selected, the switch provides for 100 mV, 300 mV, 1V, 3V, or 10V as the full scale ranges, again, with the units selected by the rear panel UNITS switch. A CALIB position on this switch connects a calibrator with a 10 g full-scale signal to provide a standard for setting the CALIB SET control.

Calibration Check

To check the calibration of the unit using the internal calibrator, place the MODE switch to MANUAL, the BW Hz switch to AMPL, and the UNITS switch to RPM. Adjust the MANUAL TUNE control for an indication of approximately 10,000 RPM. Now place the FULL SCALE RANGE switch to the CALIB position. The front panel meter should indicate 10.00 ±0.3 g's. If the indication is out of tolerance, set the CALIB SET screwdriver adjust for a correct indication.

Overload Light

The overload light is connected to provide an indication of overload. An overload condition ahead of the bandpass filter or at the level meter will cause this LED to illuminate.

Chapter 3
Performance Test

The 500AT Digital Analyzer has the circuitry packaged on a single, printed circuit board. The following procedure is a method to test the 500AT. Calibration should be performed every 12 months or when the performance check indicates that the unit is out of tolerance.

Test Equipment

Note: Equivalent equipment can be used.

1.	AC-DC Voltmeter	Keithley 191
2.	Calibrator	410A Calibrator, Astronics Test Systems
3.	Function Generator	345A Calibrator, Astronics Test Systems

Front Panel Switch Settings

Place the MODE switch to AUTO, the UNIT switch to Hz, the BW Hz switch to MED, the METER INPUTswitch to COS, and the FULL-SCALE RANGE switch to 10 Volts.

Rear Panel Switch Settings

Place the REF DIFF-SE to SE, the MODE switch to SE, and the UNIT switch to RMS.

Procedure

Connect the power line to the AC power and place the POWER-OFF switch to POWER.

DC of Frequency Checks

1. Connect the REFERENCE output of the 410A to the REF INPUT jack.

2. Set the generator for 5000 ±25 Hz. (The front panel frequency meter should read 5000 ±25 Hz or 300,000 ±1500 RPM.)
3. Connect the DC Voltmeter to the LIN DC of FREQ output jack.
4. Observe an indication of 5.00 ±0.1 Volts on the DC Voltmeter.
5. Set the generator frequency for 5 ±0.1 Hz.
6. Observe an indication of 5 ±3 millivolts on the DC Voltmeter.
7. Connect the DC Voltmeter to the LOG DC of FREQ output jack.
8. Observe an indication of 400 ±10 millivolts on the DC Voltmeter.
9. Set the generator frequency for 5000 ±25 Hz.
10. Observe an indication of 1000 ±10 millivolts on the DC Voltmeter.

Loop-Balance Tests

1. Connect the DATA OUTPUT of the 410A to the DATA INPUT of the 500AT.
2. Set the generator for 100 ±5 Hz and 10.00 ±0.05 Volts RMS.
3. Place the METER INPUT switch to SIN.
4. Observe an indication of 0 ±300 millivolts on the front panel meter.

Level Checks

1. Connect the MILLIVOLT output of the 345B to the 500AT DATA INPUT and the REFERENCE output to the REFERENCE input. Place the METER INPUT switch to AMPL.
2. Set the level of the Signal generator for 10.00 ±0.02 Volts RMS and the frequency for approximately 500 Hz.
3. Connect the DC Voltmeter to the LIN DC of LEVEL output jack.
4. Observe an indication of 10.00 ±0.22 Volts on the DC Voltmeter.
5. Connect the DC Voltmeter to the LOG DC of LEVEL output jack.
6. Observe an indication of 1,000 ±10 millivolts on the DC Voltmeter.
7. Set the level of the generator for 100 ±1 millivolts RMS.
8. Observe an indication of 600 ±10 millivolts on the DC Voltmeter.
9. Set the level of the generator for 10.00 ±0.02 Volts RMS.
10. Connect the AC Voltmeter to the FILTER AC output jack.
11. Observe an indication of 10.00 ±0.22 Volts RMS on the AC Voltmeter.
12. Place the METER INPUT switch to WIDEBAND and verify that the AC filter output is still 10.00 ±0.22 Volts RMS.
13. Place the METER INPUT switch to LOW PASS, and again, verify that the AC

filter output is still 10.00 ±0.22 Volts RMS.

RMS, PK, and PK-PK Checks

1. Set the level of the generator for 5.00 ±0.02 Volts PK (3.54 ±0.0 1 Volts RMS) at 500 Hz and the UNITS switch on the rear panel to PK-PK. (The PK-PK LED on the front panel should illuminate.) Place the METER INPUT switch to AMPL.
2. Observe an indication of 10.00 ±0.2 Volts on the front panel meter.
3. Place the UNITS switch on the rear panel to PEAK. (The PEAK LED on the front panel should illuminate.)
4. Observe an indication of 5.00 ±0.1 Volts on the front panel meter.
5. Return the UNITS switch on the rear panel to RMS. (The RMS LED should illuminate.)

Calibration Check

1. Place the FULL-SCALE RANGE switch to CALIB.
2. Observe an indication of 10.00 ±0.2 g's on the front panel meter.

Reject Output Check

1. Place the METER INPUT switch to AMPL, the MODE switch to MANUAL, and the FULL SCALE RANGE switch to 10 Volts.
2. Set the frequency of the generator for approximately 100 Hz and the level for 10.00 ±0.05 Volts RMS.
3. Turn the TUNE control on the front panel until the FREQUENCY meter indicates approximately 500 Hz.
4. Connect the AC Voltmeter to the REJECT output jack.
5. Observe an indication of 10.00 ±0.2 Volts RMS on the AC Voltmeter.
6. Return the MODE switch to AUTO and observe that the 500AT locks on to the reference input frequency. (The LOCK LED should illuminate.)
7. Verify that the AC Voltmeter indication is less than 1 Volt RMS.

Meter Range Checks

1. Verify that the MODE switch is in AUTO and the METER INPUT is in AMPL. Place the FULL SCALE RANGE switch to 10 Volts and verify that the LEVEL METER indicates 10.00 ±0.2 Volts. Set the FULL SCALE RANGE switch to 1000 g's and verify that the meter indicates 1000 ±20 g's.
2. Set the generator for 3 Volts RMS, place the RANGE switch to 300 g's, and verify that the meter indicates 300 ±6 g's. Place the RANGE switch to 3 Volts and verify that the meter reads 3.00 ±0.06 Volts RMS.
3. In the same manner set the signal generator for 1000 millivolts and verify that the LEVEL METER indicates 1.000 ±0.02 Volts RMS and 100.0 ±20 g's with the proper positioning of the RANGE switch. Then set the generator for 300 millivolts and verify 30.0 ±.6g's, and 300 ±6 millivolts RMS, on the LEVEL METER with the proper positioning of the RANGE switch. Then set the generator for 100 millivolts and verify that the LEVEL METER indicates 100.0 ±20 millivolts RMS and 10.00 ±0.2 g's.

Frequency Sweep Checks

1. Place the SWEEP MODE switch to MANUAL. Place the START-STOP switch to STOP. Set the MANUAL TUNE control for an indication of about 500 Hz on the FREQUENCY-SPEED INDICATOR.
2. Place the MODE switch to SWEEP, the START-STOP switch to START, and verify that the frequency begins increasing. Turn the SWEEP RATE control clockwise and verify that the generator sweeps faster. Place the START-STOP switch to STOP and check that the frequency SWEEP stops.

Chapter 4
Calibration Procedure

The 500AT Digital Analyzer has the circuitry packaged on a single, printed circuit board. The adjustments are all accessible from the top when the cover is removed. The locations of the various adjustments are shown on **Figure 4-1**. The following procedures provide a method to make the proper adjustments.

Test Equipment

Note: Equivalent equipment can be used.

1.	AC-DC Voltmeter	Keithley 191
2.	Calibrator	410A Calibrator, Astronics Test Systems
3.	Function Generator	345A Calibrator, Astronics Test Systems
4.	Oscilloscope	922A Tektronix

Test Procedure

Remove the top cover of the 500AT unit and connect the power line to the AC power. An internal switch S 1, located near transformer T 1, provides a means to operate with either 110 or 220 VAC power. Place the switch to the appropriate setting before applying power.

Front Panel Switch Settings

Place the MODE switch to AUTO, the UNIT switch to Hz, the BW Hz switch to MED, the METER INPUT switch to COS, and the FULL SCALE RANGE switch to 10 Volts.

Rear Panel Switch Settings

Place the reference DIFF-SE switch to SE, the MODE switch to SE, and the UNIT switch to RMS.

LIN and LOG DC of Frequency

1. Connect the squarewave output of the 410A generator to the REFERENCE input jack and set the frequency for 5000 ±25 Hz.

2. Connect the DC Voltmeter to the LIN DC of frequency output jack.

3. Set the TACH FS ADJ R8 for 5.00 ±.025 Volts indication on the DC Voltmeter.

4. Set the generator frequency for 5 ±0.1 Hz.

5. Set the ZERO ADJ R9 for a 5 ±0.1 mV on the DC Voltmeter.

6. Connect the DC Voltmeter to the LOG DC of FREQ output jack.

THE NEXT TWO ADJUSTMENTS ARE LOCATED ON ASSY 5641, NEXT TO THE CENTER OF THE MAIN PC BOARD

7. Set the input generator for 5000 ±25 Hz.

8. Set the FSADJ (R4 on Assy 5641 for a 1000 ±5 mV indication on the DC Voltmeter.

9. Set the input generator for 50 ±.2 Hz.

10. Set the -40 dB ADJ (R2 on Assy 5641) for 600 ±5 mV indication on the DC Voltmeter.

THESE ADJUSTMENTS MAY INTERACT

Metering Adiustments

1. Connect the DC Voltmeter to the SIN output jack, and set generator for 100 Hz.
2. Set the SIN ZERO ADJ R11 for a 0 ±5 mV indication on the DC Voltmeter.
3. Connect the DC Voltmeter to the COS output jack.
4. Set the COS ZERO ADJ R10 for a 0 ±5 mV indication on the DC Voltmeter.
5. Connect the DC Voltmeter to the LIN DC of LEVEL output jack.
6. Set the ZERO ADJ R20 for a 0 ±5 mV indication on the DC Voltmeter.
7. Connect the data output of the signal 346B generator to the DATA INPUT jack, set the generator output level for 10 ±0.05V RMS, and set the phase shift for zero degrees.

NOTE: The fundamental component of the square wave at the data input must be 10 Volts RMS.

8. Connect the DC Voltmeter to the COS output jack.
9. Set the CALIB SET (FP) for a 10.00 ±.05 indication on the DC Voltmeter.
10. Set the FS ADJ R1 on the DPM for a 10.00 ±.05 indication on the DPM.
11. Place the METER INPUT switch to SIN.
12. Set the LOOP ADJ R7 for a 0 ±300 mV on the front panel DPM. Repeat Step 9 (R7 adjustment affects FP adjustment).
13. Place the METER INPUT switch to COS.
14. Set the 410A output for PK-PK, the level for 10.00 ±0.05V PK-PK and the UNITS switch on the rear panel of the 500AT to PK-PK.
15. Set the PK-PK ADJ R1 for a 10.00 Volt ±.05 indication on the front panel DPM.
16. Place the UNITS switch on the rear panel to PEAK.
17. Set the PEAK ADJ R2 for a 5.00 ±.03 indication on the front panel DPM.
18. Return the UNITS switch on the rear panel to RMS.
19. Return the 410A to RMS, set the level to 3 Volt RMS, and place the FULL SCALE RANGE switch to 3V.
20. Set the X3 ADJ R4 for a 10.00 ±.05 Volt indication on the DC Voltmeter at the COS output.
21. Set the X3 ADJ R2 on the front panel DPM for a 3.00 ±.02V indication on the digital panel meter
22. Reduce the generator level to 1 Volt RMS at the DATA input jack and place the FULL SCALE RANGE switch to 1V.
23. Set the Xl0 ADJ R5 for a 1.000 ±.005 indication on the front panel DPM.
24. Reduce the generator level to 100 ±0.5 mV at the DATA input jack and place the FULL SCALE RANGE switch to 100 mV.
25. Set the Xl00 ADJ R6 for a 100.0 ±.5 mV indication on the DPM.
26. Place the FULL SCALE RANGE switch to CALIB.
27. Set the CALIB ADJ R3 for a 10.00 ±0.5 g's indication on the front panel DPM.
28. Place the FULL SCALE RANGE switch to 10 V and increase the 410A Generator level at the DATA input jack to 10.00 ±.05V RMS.
29. Connect the DC Voltmeter to the LIN DC of LEVEL jack.
30. Set the FS DC ADJ R15 for a 10.00 ±0.1 V indication on the DC Voltmeter.
31. Set the METER ADJ R24 for a full scale indication on the ANALOG level meter on the front panel.
32. Connect the AC Voltmeter to the FILTER AC output jack.

33. Set the BP ADJ R23 for a 10.00 ±0.1V RMS indication on the AC Voltmeter.
34. Connect the DC Voltmeter to the LOG DC of LEVEL output jack.

THE NEXT TWO ADJUSTMENTS ARE LOCATED ON ASSY 5641, NEAR THE CENTER OF THE MAIN PC BOARD.

35. Set the FS ADJ R3 on Assy 5641 for 1000 ±10 mV indication on the DC Voltmeter.
36. Reduce the generator at the DATA input jack to 100 ±0.5 mV.
37. Set the -40 dB ADJ R1 on Assy 5641 for 600 ±5 mV indication on the DC Voltmeter.
38. Connect the DC Voltmeter to the LIN DC of LEVEL output jack.
39. Place the METER INPUT switch to WIDEBAND.
40. Use the 345A (or any sine wave generator) to put a 10.00 ±VRMS 100 Hz sine wave into the data and ref inputs.
41. Set the wideband FS ADJ R13 for 10.0 ±0.1 V indication on the front panel DPM.
42. Change the frequency of the 345A to 10 Hz and connect the oscilloscope to the filter output.
43. Set the LOW FREQ ADJ R25 for the point where the 32X ripple is just visible.

THESE ADJUSTMENTS MAY INTERACT.

Reject Output Adiustments

1. Place the METER INPUT switch to AMPL and place the MODE switch to MANUAL.

2. Set the frequency of the 345A Generator (or sine wave) at the DATA and REF input jacks for approximately 100 Hz and the level for 10.00 ±0.1 Volts RMS. (This input signal must be a sine wave.)

3. Turn the TUNE CONTROL on the front panel until the FREQUENCY meter indicates approximately 500 Hz.

4. Connect the AC Voltmeter to the REJECT output jack.

5. Set the REJECT LEVEL ADJ R14 for 10.00 ±0.1V indication on the AC Voltmeter. (NULL ADJ R12 may need adjusting before R14 will adjust correctly.)

6. Return the MODE switch to AUTO. The 500AT will lock to the signal at the data and ref inputs.

7. Set NULL ADJ R12 for a minimum reading on the AC Voltmeter. (Check REJECT LEVEL ADJ R14 line 5.)

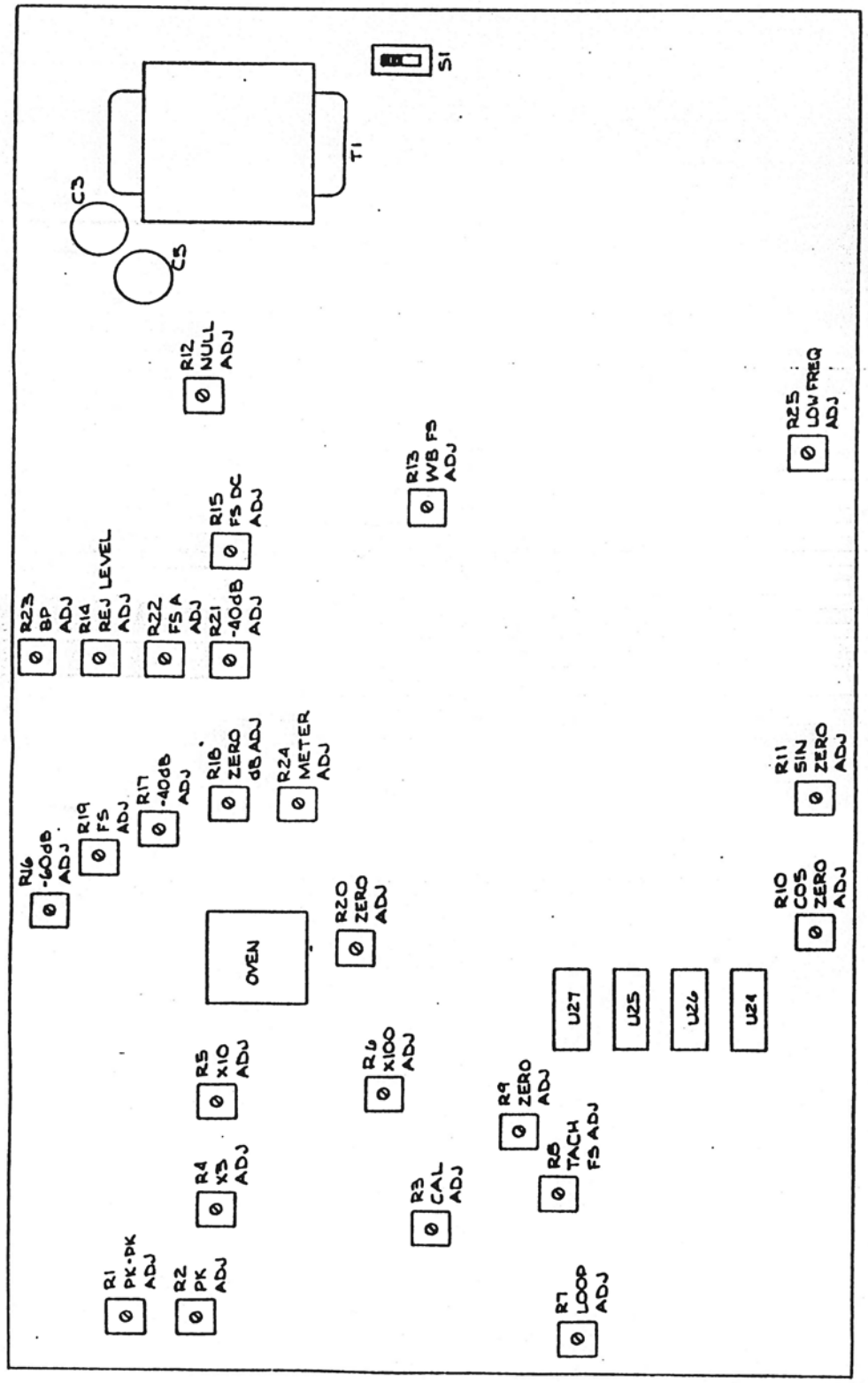

Figure 4-1, 500AT Adjustment Location Chart

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