Instruction Manual
SD1012B Tracking Filter
Part One

Legacy Manual

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SERIAL 339

INSTRUCTION MANUAL

SD1012B

TRACKING FILTER

U. S. PATENT NO. 3,018,439

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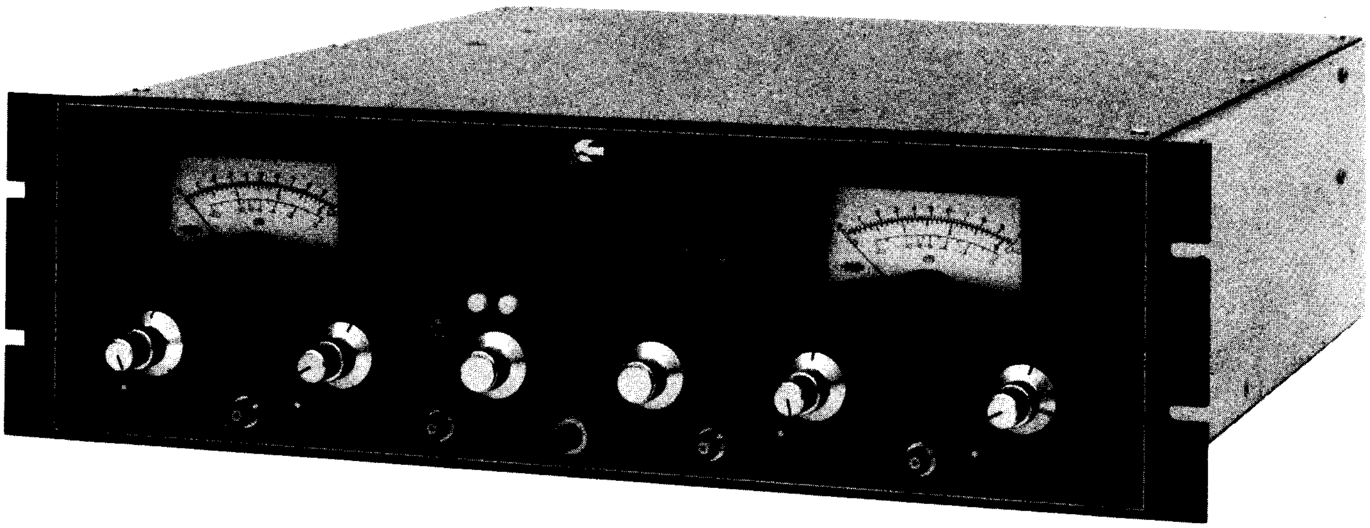

MODEL SD1012B TRACKING FILTER

RECORD OF CHANGES

REV	TEXT EDITION	ECO = E REC = R	NOTES	SN EFF
A	February 1970		Released	011
A	April 1970		Calibration Procedures	011
A	September 1977		Page 1 – 7, Filter Ø	011

D-069

RECORD OF CHANGES

REV	TEXT EDITION	ECO = E REC = R	NOTES	SN EFF

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PREFACE

RECEIVING INSPECTION PROCEDURE

The Model SD1012B Tracking Filter is shipped fully assembled, packed in a polystyrene case designed to protect it against all normal shipping hazards. Immediately upon receipt, inspect the exterior of the shipping case and note any visible damage. Keep all forms and invoices attached to the shipping case. Remove the instrument from the shipping case and test its functional operation in accordance with Section II of this manual. If shipping damage is apparent, file a claim with the carrier's claims agent and send a copy to Spectral Dynamics Corporation. Be sure to include the instrument name, model number, and serial number on all correspondence. Spectral Dynamics Corporation will advise the buyer what should be done; arrangements for repair or replacement will be made as applicable.

HARDWARE WARRANTY POLICY

All products manufactured by Spectral Dynamics are warranted against defects in materials and workmanship for one year from the date of delivery or, in the case of certain components listed in some of the operating manuals, for the specified period. We will repair or replace products which prove defective during the warranty period, providing the failure or damage has not been caused by misuses or abnormal operating conditions.

If the malfunction or a portion thereof is determined by Spectral Dynamics Corporation to have been caused by misuses or abnormal conditions of operation, an estimate of cost to repair will be submitted to the purchaser for approval before beginning any repair work.

Computers, computer accessories and other equipment made by other manufacturers and sold by Spectral Dynamics for use with its instruments are specifically excluded from this warranty. Spectral Dynamics encourages buyers of systems which include computer equipment to obtain Service Agreements with the computer manufacturer. We are happy to assist in this regard.

Liability under this warranty is limited to servicing and adjusting the instrument returned to the Spectral Dynamics Corporation factory, with transportation charges prepaid by the purchaser. NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. WE ARE NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

If a malfunction develops, notify the Customer Service Department of Spectral Dynamics Corporation or its representative in your area, giving details of the problem and the name, model and serial number of the equipment. Upon receipt of this information, service data or shipping instructions will be provided.

RETURN SHIPMENT PROCEDURE

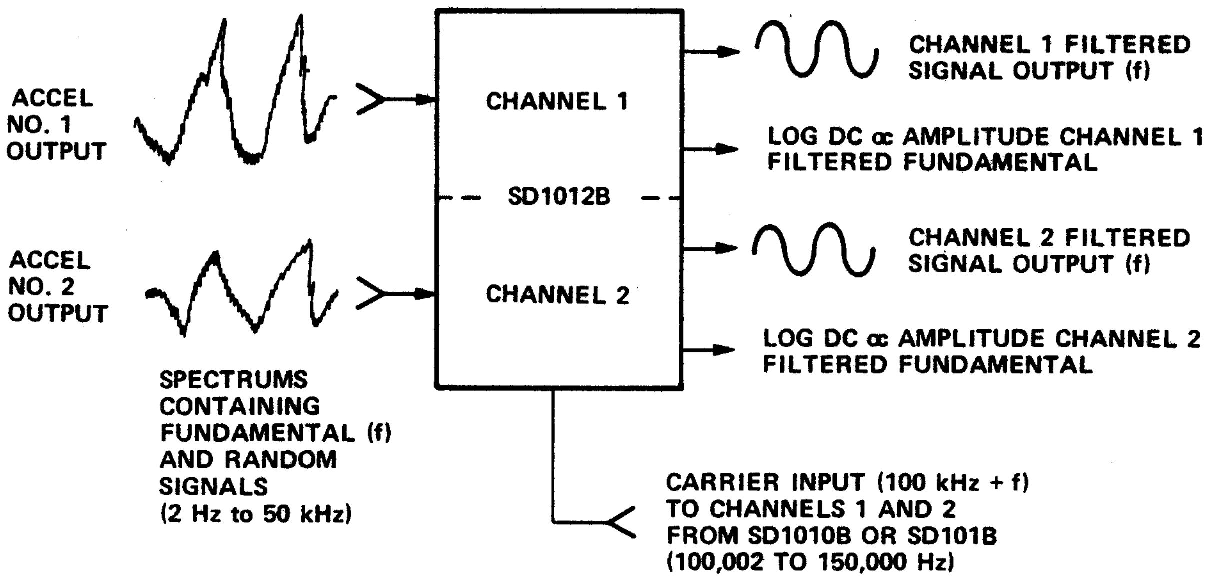
On receipt of shipping instructions, forward the instrument prepaid via air freight to the factory or authorized repair station indicated on the instructions. Replace the instrument in its original shipping case, or surround with two to three inches of shock absorbing material and then pack it in a heavy-weight cardboard box, wooden box, or other strong container.

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Model SD1012B Tracking Filter is a solid-state, dual-channel, frequency-tuned bandpass filter. From a complex spectrum such as the output of an accelerometer, either or both channels of the SD1012B can select and filter out a single frequency. For example, the following illustration shows the Model SD1012B filtering the outputs from two accelerometers attached to a specimen undergoing vibration analysis.



Each channel also provides various a-c and d-c outputs for phase measurement, recording, and other applications. A separate front-panel meter for each channel continuously displays the amplitude of the tuned signal in both volts rms and relative dB level.

An optional sine reject capability is available in either Channel 1 (Model SD1012B-1) or both Channels 1 and 2 (Model SD1012B-2). Sine reject operation is used during combined sine/random testing. (Refer to paragraph 2.2.4 in Section II.)

1.2 SPECIFICATIONS

1.2.1 INPUTS PER CHANNEL

SIGNAL

Frequency Range . . . . 2 Hz to 50 kHz

Sensitivity . . . . 31.6 mV to 10 Vrms full scale in 10 dB steps

Impedance . . . . 100 kΩ shunted by 200 pF (nominal)

CARRIER

Amplitude . . . . 2.4V p-p (nominal)

Impedance . . . . 80 kΩ

Frequency . . . . 100,002 Hz to 150 kHz

DC FREQUENCY (Auto Filter Switching)

Amplitude . . . . 0 to 1V maximum over frequency range of operation

Impedance . . . . 50 kΩ

1.2.2 OUTPUTS PER CHANNEL

FILTERED SIGNAL (Unity Gain)
(Referenced to 1 Vrms input RANGE switch position)

Frequency . . . . 2 Hz to 50 kHz

Frequency Response . . . . ±0.3 dB from 5 Hz to 30 kHz
±0.6 dB from 2 Hz to 50 kHz
From 0 dB to -60 dB of full scale

Amplitude . . . . Unity gain ±0.2 dB into open circuit, 10 Vrms maximum

Impedance . . . . Less than 1 kΩ

Dynamic Range . . . . 76 dB (Overload to Noise Floor)

Linearity . . . . ±5% of reading ±0.01% of full scale, 0 dB to -60 dB at 400 Hz

FILTERED SIGNAL (10V Full Scale)

Amplitude . . . . 10 Vrms ±0.2 dB full scale for each range into open circuit

Impedance . . . . 1 kΩ, 2 mA p-p maximum

LINEAR DC
(Referenced to 1 Vrms input RANGE switch position)

Amplitude . . . . 10V ±0.2V full scale, into open circuit

Impedance . . . . 250 Ω, 3 mA maximum

Linearity . . . . ±5% of reading, ±0.01% of full scale over 50 dB range at 400 Hz

Frequency Response . . . . ±0.3 dB from 5 Hz to 30 kHz
±0.5 dB from 2 Hz to 50 kHz
From 0 to -50 dB of full scale

100 kHz FILTERED SIGNAL

Amplitude . . . . 1.8 Vrms ±0.5 dB full scale into open circuit

Impedance . . . . <50Ω, 3 mA maximum

Frequency Range, Frequency Response, Dynamic Range, and Linearity same as Filtered Signal (Unity Gain) . . . . Referenced to 1 Vrms input RANGE switch position

LOG DC

Amplitude . . . . Full scale to -50 dB into open circuit, referenced to 1 Vrms input RANGE switch position

Sine Mode . . . . 0.2V to -0.1V (nominal)
(100 mV/dec.)

PSD Mode . . . . 0.4V to -0.2V (nominal)
(200 mV/dec.)

Impedance 500Ω

Linearity . . . . Same as LIN DC ±0.25 dB

DC Attenuator Range . . . . 0 dB to -40 dB from full scale in 10 dB steps ±0.25 dB

SINE REJECT
(Optional in Models SD1012B-1 and SD1012B-2)

Amplitude . . . . Unity gain ±0.2 dB, 3.16 Vrms maximum into open circuit

Accuracy . . . . ±0.25 dB

Dynamic Range . . . . 30 dB minimum referenced to 1 Vrms input RANGE switch position

Impedance . . . . (10 Hz to 5 kHz)
Less than 1 kΩ

METER

Frequency Range, Frequency . . . . Same as FSO (Unity Gain)

Response Linearity . . . . ±2% of full scale and Multiplier Position referenced to 1 Vrms input RANGE switch position

1.2.3 MISCELLANEOUS

SELECTIVITY . . . . 2 plug-in crystal filters (per channel)

Bandwidths . . . . Available: 1.5, 2, 5, 10, 20, 50, 100 & 200 Hz (others on special order)

Shape Factor . . . . Nominally 4 to 1 (60 dB/3 dB BW)

CALIBRATION . . . . Internal calibration reference

PSD PARAMETERS . . . . Plug-in networks for each filter program averaging time & sweep rate (using SD104A or SD114 Sweep OSC) for 4 PSD confidence levels; bandwidth normalization set by front panel control. Average time constant accuracy ±10%.

PHASE ADJUSTMENT . . . . Front panel control for each plug-in filter provides 0° to 120° phase adjust; internal 0°/180° switch also provided for each filter.

SINE AVERAGING . . . . 4 front panel switch-selectable averaging times of 0.01, 0.1, 0.5 and 1 second ±10%

INPUT/OUTPUTS . . . . BNC Connectors

POWER . . . . 105–125/210–250 Vac 50-60 Hz, at ≈190W; input line voltage switch-selectable at rear of chassis

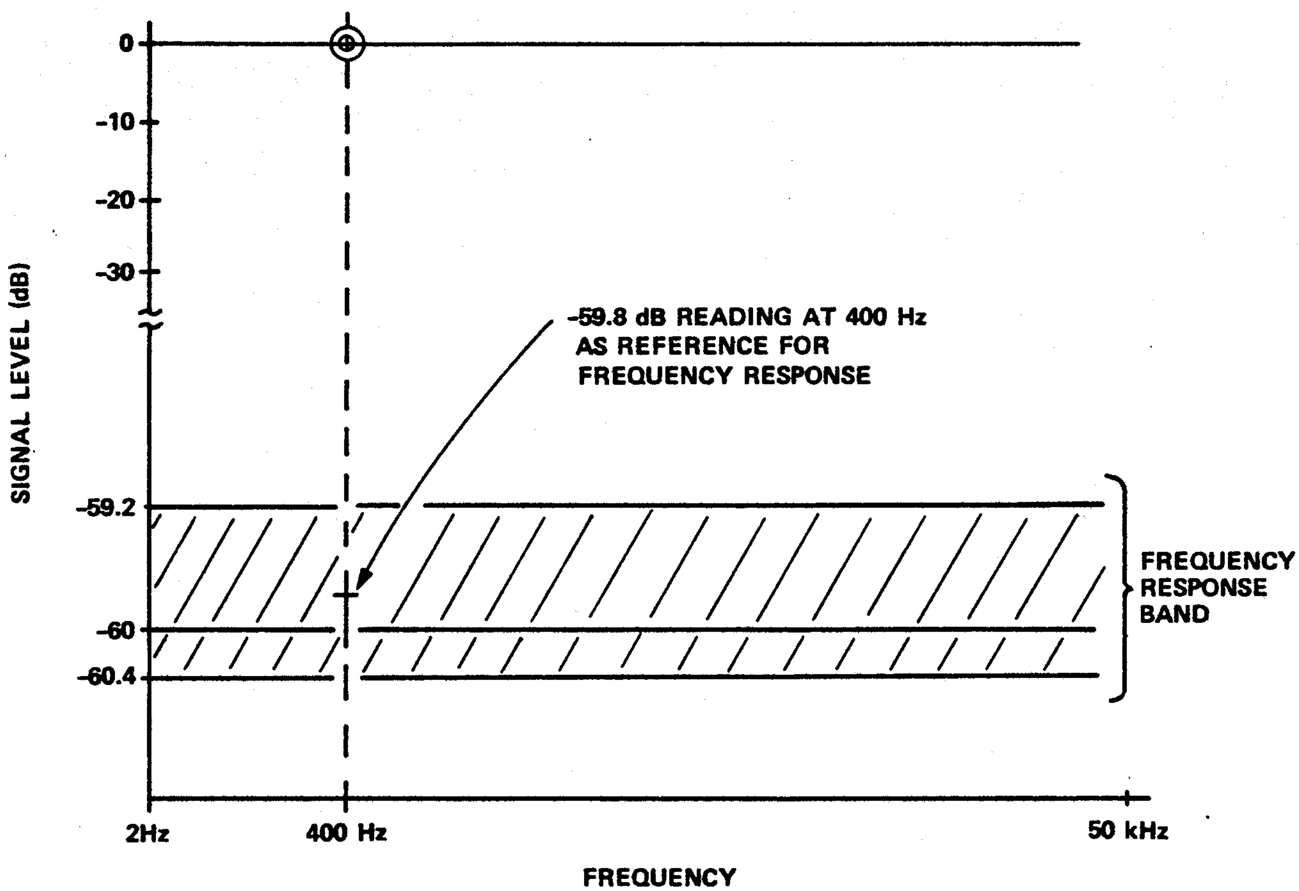
DIMENSIONS

Height . . . . 5¼" (13,3 cm)
Width . . . . 19" (48,3 cm)
Depth . . . . 17" (43,2 cm)
Shipping Weight . . . . 22 lbs (9,97 kg)

1.2.4 INTERPRETATION OF LINEARITY AND FREQUENCY RESPONSE SPECIFICATIONS

The following graph illustrates the cumulative linearity and frequency response errors possible over the frequency range of the instrument. As specified in paragraph 1.2.2, the FSO (filtered signal output) linearity is "5% of reading ±0.01% of full scale, 0 dB to -60 dB, at 400 Hz". Therefore, the total linearity error possible at full scale is ±0.425 dB, computed as follows: ±0.424 dB (5% of reading) + ≈±0.001 dB (±0.01% of full scale).

At a signal level of -60 dB from full scale, if the 400-Hz output reads +0.2 dB above true -60 dB, then the SD101B can read ±0.6 dB from this reference for any frequency from 2 Hz to 50 kHz.



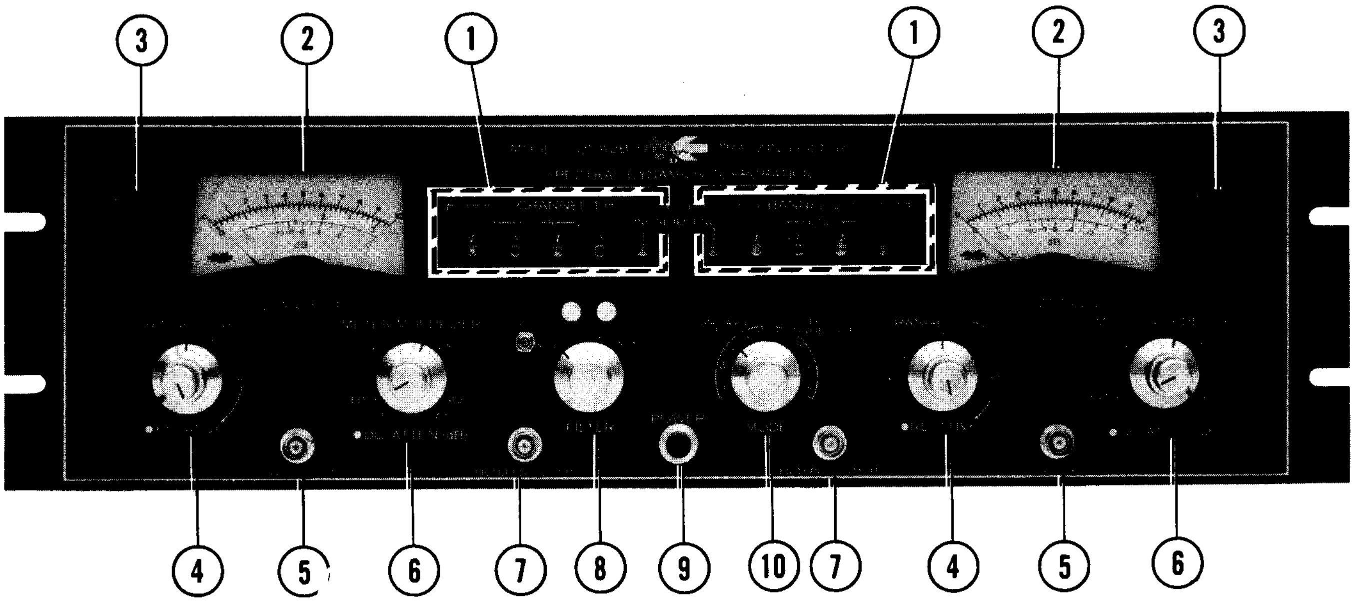


Figure 1-1. Front Panel

1.3 FRONT PANEL FUNCTIONAL DESCRIPTION

The descriptions given in the following paragraphs are keyed by circled numbers to their associated front-panel control, meter, indicator, or connector as shown in Figure 1-1, Front Panel. All interacting controls, indicators, etc., have been grouped to maintain continuity of description.

(1) Filter Calibration Group

FILTER CAL

Used during system calibration to normalize the gain of the crystal filters over the two selectable bandwidths.

FILTER ϕ

Used during system calibration to normalize the output phase of the signal through each filter relative to the other, or the output phase relative to that of another unit (SD101B Dynamic Analyzer or another SD1012B).

SINE REJECT NULL

Used during combined sine/random testing to cancel the sine component from the data input, leaving the random component which is available at SINE REJECT output connector on rear chassis. (Operational only on Models SD1012B-1, -2.)

(2) Meter, Signal Amplitude

Indicates the rms voltage amplitude and relative dB level of the input signal at the TUNING INPUT frequency in ranges determined by the RANGE (Vrms) and METER MULTIPLIER switch settings. The top 0—10 scale is used for RANGE settings of .1, 1, and 10; the center 0—3 scale is used for RANGE settings of .03, .3, and 3. The bottom -20 dB to 0 dB scale indicates the level of the measured voltage in dB referenced to full scale as determined by the RANGE (Vrms) and METER MULTIPLIER switch settings. CAL mark at extreme right-hand side is read as 10 on top scale; used during system calibration.

(3) OVERLOAD Indicator

Lights if input signal exceeds selected RANGE (Vrms) by 12 dB. If lighted, operator should select next higher range until OVERLOAD indicator extinguishes.

(4) RANGE (Vrms)/RELATIVE

This dual control performs the following functions:

RANGE (Vrms)

Outside (larger) knob selects the SIGNAL INPUT voltage range in volts rms of the instrument, except in CAL position; when set to CAL, a square wave (power line frequency) calibrated to provide full-scale deflection (CAL or 10) is applied as the input signal. If the SIGNAL INPUT amplitude exceeds the selected range by 12 dB, the OVERLOAD indicator lights. However, INPUT overload protection is provided on all input ranges.

RELATIVE

Inside (smaller) knob turns a potentiometer that provides 0 to −10 dB variable gain adjustment of the input amplifier. Can be used when making relative amplitude measurements or to adjust system gain during routine calibration. Switch detent at extreme clockwise position disconnects gain potentiometer from circuit for normal operation and during calibration.

(5) SIGNAL INPUT

Used for applying data signals to be filtered to the instrument; connected in parallel with SIGNAL INPUT connector on rear chassis. When instrument is rack-mounted in a system, input signals are normally applied to the rear chassis connector and this connector can be used for signal monitoring.

(6) METER MULTIPLIER/LOG DC ATTEN (dB)

This dual control performs the following functions:

METER MULTIPLIER

Outside (larger) knob setting determines the computing factor to be used with the Signal Amplitude Meter reading to obtain actual voltage magnitude of the SIGNAL INPUT voltage.

LOG DC ATTEN (dB)

Inside (smaller) knob provides 0 to −40 dB attenuation, in 10 dB increments, of the LOG DC output (rear chassis panel) for external recorder calibration. When not calibrating, set LOG DC ATTEN (dB) to (OPER) 0.

(7) FILTERED OUTPUT

The FSO (filtered signal out) is phase and amplitude coherent with the input signal at the tuning frequency; the FSO bandwidth equals that of the selected crystal filter. This connector is in parallel with FIL SIG UNITY GAIN OUTPUT connector on the rear chassis panel.

(8) FILTER Switch, Indicators, and 1-2 AUTO Crossover Adjust

FILTER Switch

Used to manually select any one of two internal crystal filter channels. When set to AUTO, the crystal filter channels can be selected automatically as a function of system tuning frequency by application of a d-c voltage proportional to frequency at rear chassis connector CH 1-2 DC $\propto$ FREQ INPUT. (See 1-2 AUTO Crossover Adjust below.) When set to OUT, the SIGNAL INPUT connectors (both front panel and rear chassis) are connected directly to the FILTERED SIG OUT (front panel) and UNITY GAIN (rear chassis) connectors, thus completely bypassing the instrument. However, the SIGNAL INPUT is still applied to the instrument circuit; the meter monitors signal level, and the 100-kHz FIL I.F., LIN DC and LOG DC outputs are available; filter selection is in automatic mode.

Filter Indicators

Filter indicator 1 or 2 lights to signal which crystal filter channel is being used; these indicators operate in both AUTO and manual filter select modes.

1-2 AUTO Crossover Adjust

Used in AUTO filter select mode to set frequency at which automatic switching shall occur between filter channels 1 and 2.

(9) POWER

Push button type switch/indicator used to turn instrument on and off. Push button glows red when power is on.

(10) MODE

Used to select the desired averaging time constants for filtering the linear and log d-c output voltages when analyzing sine or random (PSD) data signals. When analyzing periodic data, SINE AVG (SEC) times of .01, .1, .5, and 1 second are available; for random signals, any one of four PSD CONFIDENCE levels can be selected. (Refer to theory of operation of these functions in Section III.)

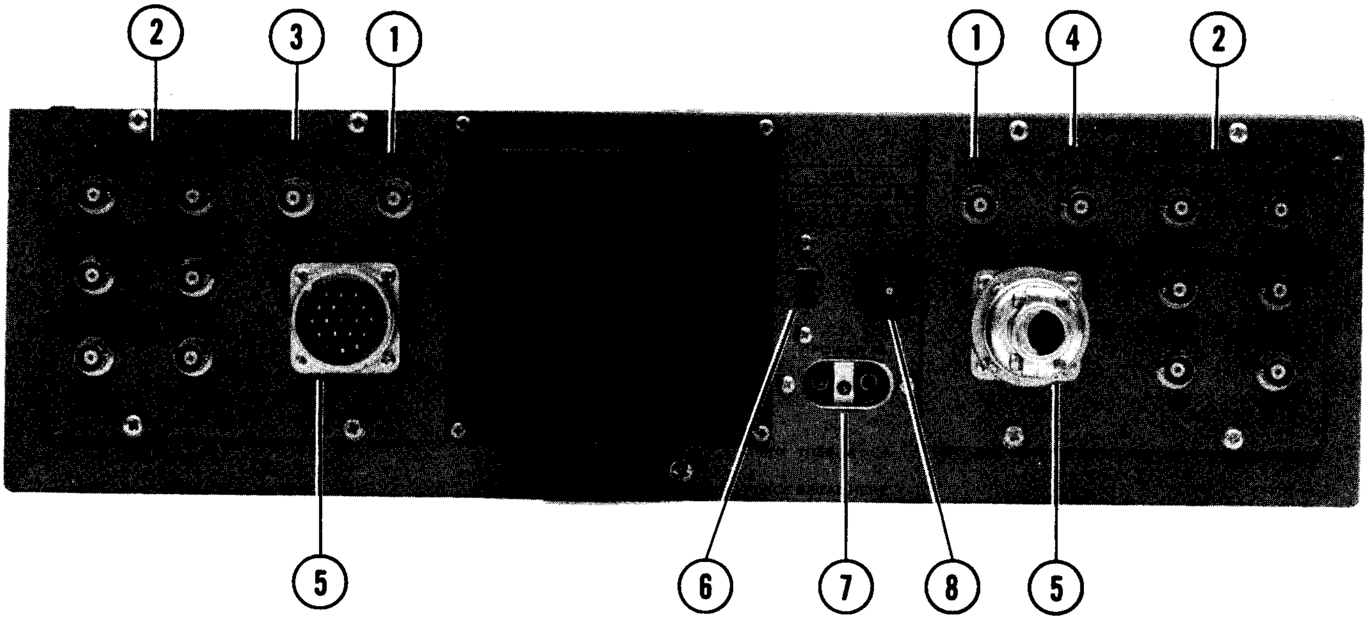


Figure 1-2. Rear Chassis

1.4 REAR CHASSIS FUNCTIONAL DESCRIPTION

The descriptions given in the following paragraphs are keyed by circled numbers to their associated rear-chassis switch or connector as shown in Figure 1-2, Rear Chassis.

Where nomenclature is common to both channels, the connector numbers in parenthesis are interpreted: (Channel 1, Channel 2).

(1) SIGNAL INPUT (J6, J14)

Used for applying data signals to be filtered to the instrument; connected in parallel with SIGNAL INPUT connector on front panel.

(2) OUTPUTS Group

FIL SIG OUTPUTS

Used for connecting the FSO to external recording equipment, to servo control equipment in a shaker system, and for closing the tracking servo loop when used in a mechanical impedance system. (Refer to application in Section II.)

UNITY GAIN (J4, J16)

These connectors are connected in parallel with associated channel front-panel FILTERED OUTPUT connector.

10V F.S. (J3, J17)

These outputs provide 10 volts rms full scale over the selected RANGE (Vrms); i.e., with full-scale input on any range, this output is 10 Vrms. Note that this output is present even with the FILTER switch set to OUT.

100-kHz FIL I.F. (J7, J19)

Provides a 100-kHz filtered signal that is amplitude and phase coherent with the data input signal at the tuning frequency; the bandwidth equals that of the selected crystal filter passband. This signal is used for phase comparison in mechanical impedance and mode study systems, for phase control, and cross-spectrum analysis.

LOG DC (J8, J18)

Provides a d-c voltage output proportional to the log of the amplitude of the data input signal at the tuning frequency, for connecting to an X-Y recorder.

SINE REJECT (J9, J21)

Used during combined sine/random testing to connect the output of the sine reject circuit to external control equipment. This signal contains only the random component of the input data spectrum, the sine component being rejected, over the bandwidth of the selected crystal filter passband. (Output available only on Models SD1012B-1, -2.)

LIN DC (J10, J20)

Provides a d-c voltage output that is linearly proportional to the amplitude of the data input signal at the tuning frequency.

(3) CH 1-2 CARRIER INPUT (J15)

Accepts 2.4V p-p carrier signal (100,002 Hz to 150,000 Hz) supplied by a Model SD1010B Carrier Generator or SD101B Dynamic Analyzer.

(4) CH 1-2 DC $\propto$ FREQ INPUT (J5)

Used for applying a d-c voltage proportional to the system tuning signal frequency, supplied by the sweep generator or a frequency log converter, for controlling the automatic filter-bandwidth and PSD confidence level switching circuitry. The input voltage applied must not exceed 1 volt over the frequency range of operation.

(5) AUX FUNCTIONS (J11, J22)

Used for connecting interunit control functions when instrument is used in a mechanical impedance or PSD analysis system. See Tables 2-1 and 2-2 in Section II and the schematic diagram for system interconnection details. Refer also to the instruction manual for the system in which the instrument is installed.

(6) 115/230 Switch

Facilitates changeover of primary power input circuit for either 115V or 230V operation. Proper input voltage to be applied shows in window; screwdriver blade slot is up for 115V operation and down for 230V operation.

(7) POWER IN (J19)

Accepts 3-wire plug and cable (supplied) for applying 115/230 Vac 50-60 Hz primary input power. Center terminal is chassis ground. Uses Belden No. 17258 cable.

(8) FUSE

Contains 3AG type, SLO-BLO fuse; 1-½A for 115V operation or ¾A for 230V operation.

SECTION II

OPERATION

2.1 GENERAL

The Model SD1012B Tracking Filter (two-channel) was designed to be used as an integral part of a dual-channel Power Spectral Density (PSD) or Mechanical Impedance (MZ) system, or other multi-channel tracking filter system. Therefore, the operator should refer to the applicable system instruction manual, which includes installation and operation instructions for the Model SD1012B. See also Figures 1-1 and 1-2 in Section I of this manual for the description and location of all operating controls, indicators, and connectors.

The following preliminary setup, turn-on, and operating instructions are provided mainly for the user who has purchased the SD1012B as a separate instrument for integration into an existing system. In this case, it is assumed that a system interconnection diagram has been designed either by the user or by an SDC Engineering Representative, as applicable.

2.2 OPERATIONAL CHECKOUT PROCEDURE

The following procedure should be performed upon receipt of the instrument and after maintenance to ensure correct overall operation.

2.2.1 Preliminary Setup

a. Check that the 115/230 switch on instrument rear chassis is set to proper input line voltage and that proper fuse is installed.

b. Remove instrument top cover and filter section cover, and install crystal filter(s) in each channel.

NOTES

1) If only one crystal filter is used in each channel, plug it into FILTER 1 socket. If two filters are used, it is recommended that they be plugged into filter sockets 1 and 2, in order, from lower to higher bandwidth.

(Cont'd)

2) If PSD plug-in assemblies (11312-) are used, ensure that the 11312 assembly dash number corresponds to the associated filter channel bandwidth. For example: if a 5-Hz bandwidth filter is used in FILTER 1 socket, the Channel 1 PSD plug-in assembly must be marked 11312-5.

CAUTION

A PSD Plug-in Assembly (11312-) MUST BE installed in each Crystal Filter channel used or the instrument WILL NOT operate in PSD mode.

c. Replace filter section cover and instrument top cover, and connect power cord (supplied) to primary power source.

d. Ensure that plug P11 (SDC 11514) and P22 (SDC 11515) are inserted into AUX rear-chassis connectors J11 and J22. Figure 2-1 shows construction details for plugs P11 and P22.

e. Connect the SD1010B CARRIER OUT, 2.4V P-P, to the SD1012B CH 1-2 CARRIER INPUT (J15).

f. On SD1012B, press front-panel POWER switch/indicator; it should glow red indicating power is on. Allow at least 1 hour for crystal filters to warm up. Also apply power to SD1010B.

2.2.2 Filter Calibration

After the procedure outlined in paragraph 2.2.1 has been performed and the SD1012B has warmed up for at least 1 hour, use the following procedure to calibrate Channel 1 and then Channel 2.

CAUTIONS

1) The SD1012B (and SD1010B) internal CAL signal frequency is the power line frequency. Assuming 60 Hz line frequency, if a 150-Hz BW filter is calibrated using internal CAL signal, an error of ≈1% would be introduced. Therefore, when calibrating a 100-Hz or higher BW filter, an external signal whose frequency ≥½BW

(Cont'd)

must be applied to the SD1012B SIGNAL INPUT and the SD1010B TUNING INPUT. In this case, set the SD1012B RANGE switch as required by the level of the external calibration signal, and adjust the SD1010B TUNING AMPL adjust for center-scale reading on SD1010B TUNING AMPLITUDE meter. Observe the following CAUTION which is applicable to system operation.

2) In any position of the SD1012B RANGE (Vrms) switch other than CAL, the switch is part of a closed-circuit interlock circuit via rear chassis connector J22, pins 17 and 19. Therefore, when the SD1012B RANGE (Vrms) switch is not in the CAL position, associated system instrumentation could be activated causing undesirable excitation of a specimen under test.

The following procedure assumes the use of filters having less than 100-Hz BW, with the narrowest bandwidth filter in FILTER position No. 1, Channel 1.

a. On SD1010B, set OPER/CAL switch to CAL.

b. On SD1012B, set both Channels 1 and 2 RANGE (Vrms) and METER MULTIPLIER switches to CAL position.

c. On SD1012B, adjust both Channels 1 and 2 RELATIVE gain controls full clockwise to CAL position (switch detent).

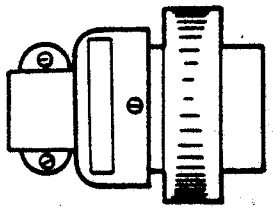
d. On SD1012B, set FILTER select switch to 1.

e. On SD1010B, adjust the FREQ control for peak reading on SD1012B Signal Amplitude Meter of Channel 1. (If the meter peaks at full scale or over, adjust FILTER 1 CAL potentiometer for meter reading of ≈ -2 dB from full scale.)

Perform the following steps f. through h. first using Channel 1 controls, switches, and meter.

f. On SD1012B, adjust FILTER 1 CAL potentiometer for full-scale reading on Signal Amplitude Meter.

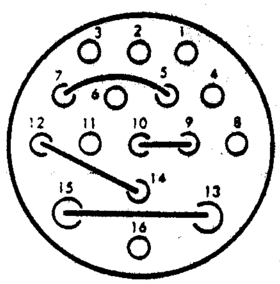
g. If a second filter has been installed, set FILTER select switch to 2. (Do not touch FREQ control on SD1010B.)



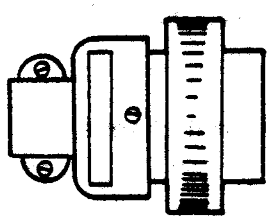
CANNON
SK-C16-21C-1/2

USE NO. 22 BUS WIRE AND CONNECT:

FROM	TO
5	7
9	10
12	14
13	15



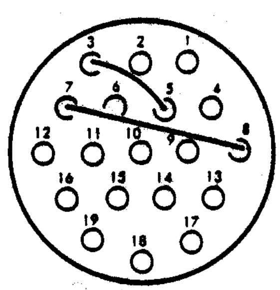
P11
(SDC 11514)



CANNON
SK-19-21C-1/2

USE NO. 22 BUS WIRE AND CONNECT:

FROM	TO
3	5
7	8



P22
(SDC 11515)

Figure 2-1. Jumpered Plugs P11 and P22, Construction Details (SD1012B)

h. On SD1012B, adjust FILTER 2 CAL potentiometer for full-scale reading on Signal Amplitude Meter.

Repeat steps f. through h. using SD1012B Channel 2 controls, switches, and meter.

2.2.3 AUTO Filter-Select Crossover Adjust

If two filters are used, automatic filter selection is preset as follows:

CAUTION

The DC ∝ FREQ filter-switching input voltage applied to J5 must not exceed 1 volt over the full frequency range of operation. The 0 to 1V DC ∝ LOG FREQ output from an SDC Model SD104A or SD114 Sweep Oscillator, or a Model SD116 Log Frequency Converter is compatible with this requirement.

a. Connect the dc ∝ frequency output 1V maximum of a Sweep Oscillator (SD104A, SD116 Log Frequency Converter and a sweep oscillator, or equivalent source) to rear-chassis connector J5, CH 1-2 DC ∝ FREQ INPUT.

b. On SD1012B, set FILTER switch to AUTO.

c. On SD1012B, adjust the 1-2 AUTO crossover frequency potentiometer fully clockwise. FILTER 1 indicator lamp should be lighted.

d. Adjust sweep oscillator to 500 Hz, FILTER 1 to 2 crossover frequency.

e. Adjust 1-2 AUTO crossover frequency potentiometer until FILTER 2 indicator lights.

f. Adjust sweep oscillator to sweep from approximately 100 Hz to above 500 Hz.

g. Reset sweep oscillator to lower limit; then initiate an up-sweep. Observe the sweep oscillator frequency meter reading and the FILTER indicators; crossover should occur between FILTER 1 and 2 at 500 Hz.

2.2.4 SINE REJECT (Models SD1012B-1 and SD1012B-2 only)

The Model SD1012B-1 contains Sine Reject Card A3 in Channel 1; the Model SD1012B-2 contains Sine Reject Cards A3 and A7 in Channels 1 and 2 respectively. After the filter(s) have been calibrated in accordance with paragraph 2.2.2, check for proper sine reject operation as follows:

a. Set FILTER switch to 1, RANGE switch to 1, and METER MULTIPLIER switch to 1.

b. Apply 400-Hz, 1 Vrms (full-scale) signal to both the SD1012B SIGNAL INPUT (J6) and to the SD1010B TUNING INPUT (J1).

c. On SD1010B, adjust front-panel TUNING AMPL control for center-line (green area) reading on TUNING AMPLITUDE meter.

d. Connect an rms voltmeter (HP3400A or equivalent) to J9, SINE REJECT OUTPUT.

e. Adjust front-panel CHANNEL 1, FILTER 1 ϕ adjust and the internal 180° phase reversal switch for minimum rms reading at J9.

f. Now alternately adjust the CHANNEL 1, FILTER 1 ϕ adjust and the CHANNEL 1 SINE REJECT NULL for minimum output, at least 30 dB below 1 Vrms.

NOTE

If SINE REJECT output cannot be properly reduced using the CHANNEL 1, FILTER 1 ϕ adjust and SINE REJECT NULL, adjust very slightly the FREQ adjust on the SD1010B Carrier Generator.

CAUTION

A PSD Plug-in Assembly (11312-) MUST BE installed in each Crystal Filter Channel used or the instrument WILL NOT operate in PSD mode. Refer to paragraph 2.2.1 for installation NOTES.

g. If instrument is Model SD1012B-2, repeat steps a. through f. using J14 (SIGNAL INPUT), J21 (SINE REJECT OUTPUT), and Channel 2 ϕ adjust and SINE REJECT NULL. (Do not touch FREQ adjust on SD1010B.)

h. Proceed with the final operational checks in the following paragraphs.

2.2.5 Final Operational Checks

After the filters have been calibrated and crossover adjustment checked, check for proper outputs from each channel as follows:

a. Set FILTER switch to 1, both RANGE (Vrms) switches to 1, both METER MULTIPLIER switches to 1, and MODE switch to PSD 1.

b. Apply 400-Hz, 1 Vrms (full-scale) signal to both the SD1012B SIGNAL INPUT (J6) and to the SD1010B TUNING INPUT (J1).

c. On SD1010B, adjust front-panel TUNING AMPL control for center-line (green area) reading on TUNING AMPLITUDE meter.

d. Using applicable test equipment, check for the following outputs:

Check Point (CH 1, CH 2)	Reading
FIL SIG UNITY GAIN (J4, J16)	1 Vrms ±40 mV rms, 400 Hz
FIL SIG 10V F.S. (J3, J17)	10 Vrms ±0.4 Vrms, 400 Hz
100-kHz FIL I.F. (J7, J19)	1.8 Vrms ±80 mV rms
LOG DC (J8, J18) (PSD MODE)	400 mV ±5 mV
LIN DC (J10, J20)	+10.0V ±50 mV
Signal Amplitude Meters	1 Vrms full-scale

Remove all test equipment, remove power, and place instrument in service.

2.3 OPERATION

2.3.1 General

The following paragraphs describe the operation of the SD1012B (SD1012B-1, -2) in various applications. In each case, certain preliminary adjustments are required. These are described in paragraphs 2.2.1 Preliminary Setup, 2.2.2 Filter Calibration, 2.2.3 AUTO Filter-Select Crossover Adjust (using desired frequencies), and 2.2.4 Sine Reject (for Models SD1012B-1, -2).

2.3.2 Use as a Dynamic Analyzer/Tracking Filter

a. Perform the applicable preliminary adjustments of paragraphs 2.2.1 through 2.2.4.

b. Set the front-panel RANGE (Vrms) and METER MULTIPLIER switches as required by the expected dynamics of the SIGNAL INPUT (both channels).

c. Connect the 2.4V p-p carrier output of the associated SD1010B (or SD101B) to J15, CH 1-2 CARRIER INPUT.

d. Apply the system tuning signal (constant-level sine wave) to the TUNING INPUT of the associated SD1010B (or SD101B).

e. On SD1010B (or SD101B), adjust the front-panel TUNING INPUT AMPL adjust for center-scale (green area) reading on TUNING AMPLITUDE meter.

f. Set the MODE switch to the desired SINE AVG (SEC) position.

Table 2-1. AUX FUNCTIONS Connector J11 Circuit Descriptions

J11 Pin	Function Description
1	Sweep rate control ground return circuit
2	DC $\propto$ frequency output for slaving remote filter select
3	100-kHz I.F. unfiltered output (Channel 1)
4	Shield ground for pin 3
* 5	100-kHz FIL I.F. input (return from pin 7 output or external filter)
6	Shield ground for pins 5 and 7
* 7	100-kHz FIL I.F. output, (Channel 1, FIL 2)
8	External d-c input (Channel 1) for averaging
* 9	Averaged d-c output (Channel 1, Filter 2)
*10	DC averaging filter BW control
11	Spare
*12	Remote sweep rate control source (Channel 1, Filter 2 position only)
*13	External filter position indicator control ground return for pin 15
*14	Sweep rate control output (Channel 1, Filter 2)
*15	External filter position indicator control
16	Slaving remote BW select

*See Figure 2-1 for P11 plug wiring details.

Table 2-2. AUX FUNCTIONS Connector J22 Circuit Descriptions

J22 Pin	Function Description
1	100-kHz I.F. unfiltered output (Channel 2)
2	Shield ground for pin 1
* 3	100-kHz FIL I.F. output (Channel 2, FIL 2)
4	Shield ground for pins 3 and 5
* 5	100-kHz FIL I.F. input (return from pin 3)
6	External d-c input (Channel 2) for averaging
* 7	Averaged d-c output (Channel 2, Filter 2)
* 8	DC averaging filter BW control
9	Slaving control (+dc in Filter 2 position)
10	Sweep rate output (to SD104A J30-J, or SD114 J9-8)
11	+15V or 15V reference input from Sweep Oscillator (SD104A J30-L, or SD114 J9-4)
12	Return path for internal oscillator sweep rate control (from SD104A J30-H, or SD114 J9-9)
13–16	Spares
17	System closed-loop interlock circuit via front-panel RANGE switches (See also pin 19.)
18	Sweep rate control ground return circuit
19	Interlock circuit return for pin 17

*See Figure 2-1 for P22 plug wiring details.

NOTE

When analyzing complex sinusoidal signals, and d-c averaging is used, the time indicated on the MODE switch is the d-c averaging-circuit time constant (for the LOG and LIN DC outputs). To determine the overall instrument time constant, the selected filter bandwidth must be considered.

g. Connect desired external recording equipment to the output connectors. All outputs of the SD1012B will be proportional to the SIGNAL INPUT (in the same channel) at the tuned frequency as described in Section III of this manual.

NOTE

If the FILTER switch is set to OUT, the UNITY GAIN FIL SIG OUTPUTS (J4, J16) and FILTER OUTPUT (front panel) connectors are switched directly to the SIGNAL INPUT. However, the SIGNAL is processed by the instrument (FILTER AUTO-select mode) and all other outputs are normal, including the Signal Amplitude meter readings, FIL SIG 10V F.S., LOG DC, LIN DC, etc.

2.3.3 Use as a Power Spectrum Analyzer (PSD Analysis)

CAUTION

A PSD Plug-in Assembly (11312-) MUST BE installed in each Crystal Filter channel used or the instrument WILL NOT operate in PSD mode. Refer to paragraph 2.2.1 for installation NOTE.

NOTE

The standard PSD Plug-in Assemblies (11312) for the SD1012B are designed for use over the frequency range of 5 Hz to 5 kHz; for example, a Model SD104A-5 Sweep Oscillator with its MULTIPLIER (A) switch set to 1, or a Model SD114 Sweep Oscillator Servo. The

(Cont'd)

oscillators then have a maximum sweep rate of 100 Hz/s and a sweep rate sensitivity of 0.1 V/Hz/s. If other frequency ranges are desired using the SD104A series of sweep oscillators, refer to Appendix A (rear of this manual) for calculations of proper sweep rate resistor values.

For optimum power spectrum analysis, the SD1012B should be used with a Model SD1010B Carrier Generator, a Model SD104A Sweep Oscillator or Model SD114 Sweep Oscillator Servo, and an X-Y Recorder. (See Figure 2-2.)

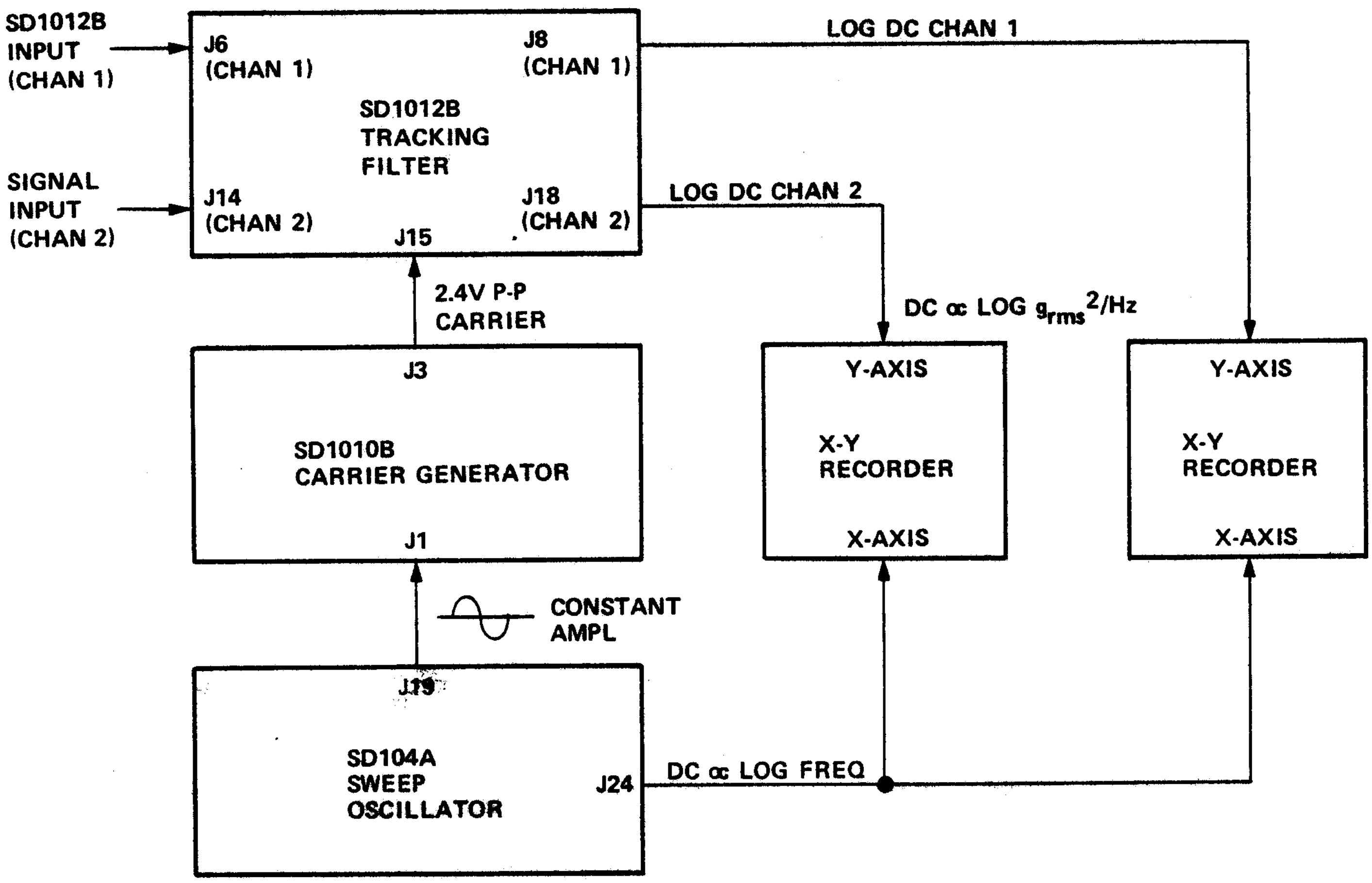


Figure 2-2. Equipment Setup for PSD Analysis

Using the setup of Figure 2-2, the SD1012B can be calibrated in either of two ways: The internal calibration signal of the SD1012B representing a known absolute voltage level may be used, or an external calibration signal representing a certain known physical quantity such as 10g rms may be applied to the input of the SD1012B from an on-line test or from a tape recording. In either case,

i. See Table 2-3 and set the SD1012B MODE switch to the desired PSD CONFIDENCE position (1, 2, 3 or 4).

j. On the SD104A, preset the desired upper and lower sweep limits. Adjust the SD104A for LINEAR sweep mode.

k. Calibrate the X-axis of the X-Y recorder to the desired frequency sweep range (step j. above). This procedure assumes the use of log/log graph paper. Alternately press RESET UP and RESET DOWN while adjusting the recorder ZERO and GAIN control until the upper and lower limits line up with the corresponding frequencies on the graph paper.

l. Calibrate the Y-axis of the X-Y recorder by stepping the SD1012B DC ATTEN (dB) switch in 10 dB steps; make each 10 dB step correspond to 1 decade on the graph paper.

Up to this point, the relative span of both the X and Y axes have been correctly calibrated. Now, an absolute number must be assigned in terms of, for example, g^2_{rms}/Hz for a point on the Y-axis of the X-Y recording. Also, a full-scale range setting must be established which will be used during analysis.

For example: If a random vibration test of 20 g_{rms} is to be performed and a signal sensitivity of 10 mV rms/g_{rms} is employed, a broadband signal of approximately 200 mV rms will be applied to the SD1012B. For this example, the SD1012B range (Vrms) setting is 0.3; thus, full-scale meter reading corresponds to 31.6 g_{rms}.

The Y-axis calibration point on the recorder is now established using the equation: (See footnote.)

$$\text{CAL} = \frac{(\text{Full Scale} \times 1.13)^2}{\text{BW}}$$

If a 5 Hz bandwidth filter were being used in the first filter position, the calibration point for the above example would become:

$$\text{CAL} = \frac{(31.6\ g_{rms} \times 1.13)^2}{5\ \text{Hz}} = 255\ g^2_{rms}/\text{Hz}$$

Now adjust the Y-axis zero control of the X-Y recorder so the pen lines up exactly on a reading of 255 on the top decade of the log/log paper. Because this number is an extremely high PSD

*Additional technical information concerning PSD analysis is included in SDC Technical Publications PS-1 and PS-2 in the back of this manual.

Table 2-3. PSD Confidence Parameters

Filter BW		PSD Confidence Switch Position 1	2	3	4
1.5	Number of Degrees of Freedom (n) (n = 4BRC)	30	30	40	40
2		40	40	40	40
5		40	80	100	100
10		40	80	120	200
20		40	80	120	200
50		40	80	120	200
100		80	80	120	200
200		80	120	160	240
1.5	Averaging Time (sec.) (RC = n/4B)	5	5	6.67	6.67
2		5	5	5	5
5		2	4	5	5
10		1	2	3	5
20		0.5	1	1.5	2.5
50		0.2	0.4	0.6	1
100		0.2	0.2	0.3	0.5
200		0.1	0.15	0.2	0.3
1.5	Analysis Rate (Hz/sec.) (AR = B/4RC)	* 0.1 (0.075)	* 0.1 (0.075)	* 0.1 (0.055)	* 0.1 (0.055)
2		0.1	0.1	0.1	0.1
5		0.625	0.313	0.25	0.25
10		2.5	1.25	0.83	0.5
20		10	5	3.33	2
50		62.5	31.3	21	12.5
100		*100 (125)	*100 (125)	83	50
200		*100 (500)	*100 (333)	*100 (250)	*100 (166)

*The values listed are within the sweep rate programming range of the SD104A-2 and SD104A-5 (0.1 to 100 Hz per second); the values in parenthesis are the calculated values. If an SD104A-1 or an SD104-10 is used, consult your SDC Factory Representative for correct PSD Assembly information.

level and will in all actual cases never be achieved during a test, a level more consistent with the expected data such as 0.255 g^2_{rms}/Hz can now be set up on the recorder by attenuating the log dc output three decades in three 10 dB steps. (Recall that a 10 dB change on the DC ATTEN (dB) has been calibrated to equal one decade on the X-Y recorder paper.) If the log dc output is attenuated by three 10 dB steps, the calibration point on the recorder becomes 0.255 g^2_{rms}/Hz. After the 30 dB of attenuation has been introduced, adjust the X-Y recorder ZERO control again for an exact reading of 255 on the top decade of the log/log graph paper. The top of the graph paper now represents 1.0 g^2_{rms}/Hz.

After the frequency and amplitude axes of the recorder have been calibrated, adjust the filter crossover frequencies as follows:

m. On SD1012B, set FILTER switch to AUTO.

n. On SD1012B, adjust the 1-2 AUTO crossover frequency potentiometer fully clockwise. (FILTER 1 indicator should be lighted.)

o. Adjust sweep oscillator to desired FILTER 1 to 2 crossover frequency.

p. Adjust 1-2 AUTO crossover frequency potentiometer until FILTER 2 indicator lights.

After performing the preceding steps, a PSD analysis is performed as follows:

q. On SD104A rear chassis, place the SWEEP RATE switch to EXT. (Ensure that the correct interconnect cable is connected between J30 of the SD104A and J11 and J22 of the SD1012B.)

r. On SD104A, set the sweep mode switch to SINGLE LINEAR SWEEP.

s. On SD1012B, set MODE switch to desired PSD CONFIDENCE position (1, 2, 3 or 4). (See Table 2-3.)

t. On SD1012B, set LOG DC ATTEN (dB) switch to (OPER) 0.

u. On SD1010B, set OPER/CAL switch to OPER.

v. Apply signal to be analyzed (output of accelerometer) to SD1012B SIGNAL INPUT.

w. Start test by pressing the SD104A SWEEP UP push button.

2.3.3.2 Calibration Using an External Calibration Signal

To calibrate to an external signal, the relative span of the recorder's X and Y axes are first calibrated to the SD1012B and SD1010B internal CAL signal. The X-axis is calibrated to the frequency sweep range, and then the Y-axis is calibrated to the external signal which is applied to the SD1012B SIGNAL INPUT. Proceed as follows:

a. Perform steps a. through l. of paragraph 2.3.3.1.

b. Refer to Figure 2-2, and apply the external calibration signal (sinusoidal) to the SD1012B SIGNAL INPUT.

c. On SD1012B, select widest BW filter which will be used for the subsequent PSD analysis. Note, however, that the filter BW must not exceed two times the calibration frequency.

d. On SD1012B, set the RANGE (Vrms) switch (with signal applied) so that the Signal Amplitude Meter reads within the upper 10 dB of scale selected. (The OVERLOAD indicator must not be lighted.)

e. Set the SD104A sweep mode switch to MAN., and manually adjust its output to equal the calibration frequency. This is accomplished by adjusting the SD104A frequency for a peak reading on the SD1012B Signal Amplitude Meter.

f. Compute the values of the calibration parameters as follows:

$$\text{Calibration Value} = \frac{(\text{External cal sig in } g_{rms} \times 1.13)^2}{\text{BW in Hz}}$$

For example: If the external calibration signal input represents 8 g_{rms}, and a 20-Hz BW filter is used, then:

$$\text{CAL Value} = \frac{(8\ g_{rms} \times 1.13)^2}{20} = 4.07\ g^2_{rms}/\text{Hz}$$

NOTE

Assuming the preceding example, after the SD1012B is properly tuned (peak reading on meter) and calibrated, the meter reading truly represents 8 g_{rms} corresponding to a resultant PSD calibration point of 4.07 g^2_{rms}/Hz. (The SD1012B Signal Amplitude Meter will not necessarily read 8.)

g. Adjust the Y-axis zero control of the X-Y recorder so the pen lines up exactly on a reading of 4.09 on the top decade of the log/log paper. Because this number may be quite high and may not be achieved during a test, a level more consistent with the expected data such as 0.04 g^2_{rms}/Hz can now be set up on the recorder by attenuating the log dc output two decades in two 10 dB steps. (Recall that a 10 dB change on the log dc attenuator has been calibrated to be equal to one decade on the X-Y recorder paper.) If the log dc output is attenuated by two 10 dB steps, the calibration point on the recorder now becomes 0.04 g^2_{rms}/Hz. After the 20 dB of attenuation has been introduced, adjust the X-Y recorder ZERO control again for an exact reading of 4.09 on the top decade of the log/log graph paper.

After the frequency (X) and amplitude (Y) axes of the recorder have been calibrated, adjust the filter crossover frequencies as follows:

h. On SD1012B, set FILTER switch to AUTO.

i. On SD1012B, adjust the 1-2 AUTO crossover frequency potentiometer fully clockwise. FILTER 1 indicator lamp should be lighted.

j. Adjust sweep oscillator to desired FILTER 1 to 2 crossover frequency.

k. Adjust 1-2 AUTO crossover frequency potentiometer until FILTER 2 indicator lights.

After performing the preceding steps, the PSD analysis is performed as follows:

l. On SD104A rear chassis, place the SWEEP RATE switch to EXT. (Ensure that the correct interconnect cable is connected between J30 of the SD104A and J11 and J22 of the SD1012B.

m. On SD104A, set the sweep mode switch to SINGLE LINEAR SWEEP.

n. On SD1012B, set MODE switch to desired PSD CONFIDENCE position (1, 2, 3 or 4).

o. On SD1012B, set LOG DC ATTEN (dB) switch to (OPER) 0.

p. On SD1010B, set OPER/CAL switch to CAL.

q. Apply signal to be analyzed (output of accelerometer) to SD1012B SIGNAL INPUT.

NOTE

If the SD1012B RANGE (Vrms) switch must be changed to accommodate the level of data signal being analyzed, recall that a 20 dB change in the input range is equivalent to a 2 decade change in the plotted power spectrum.

r. Start test by pressing the SD104A SWEEP UP push button.

2.3.4 Using SINE REJECT (J9/J21) OUTPUT (Model SD1012B-1/SD1012B-2)

The SD1012B-1 contains in Channel 1 only an additional circuit card A3, Sine Reject Assembly 10954-1. The Model SD1012B-2 contains cards A3 and A7 (identical cards) which provide SINE REJECT OUTPUTS in both Channels 1 and 2. (See schematic DWG. NO. 11386, Sheet 1 of 4, at rear of manual.) The following simplified block diagram (Figure 2-3) shows how the raw input data is routed to the sine reject circuit. Here it is mixed with the filtered signal output (displaced in phase by 180 degrees), and the data signal at the tuning frequency is thus canceled, leaving all other data components in the SINE REJECT OUTPUT.

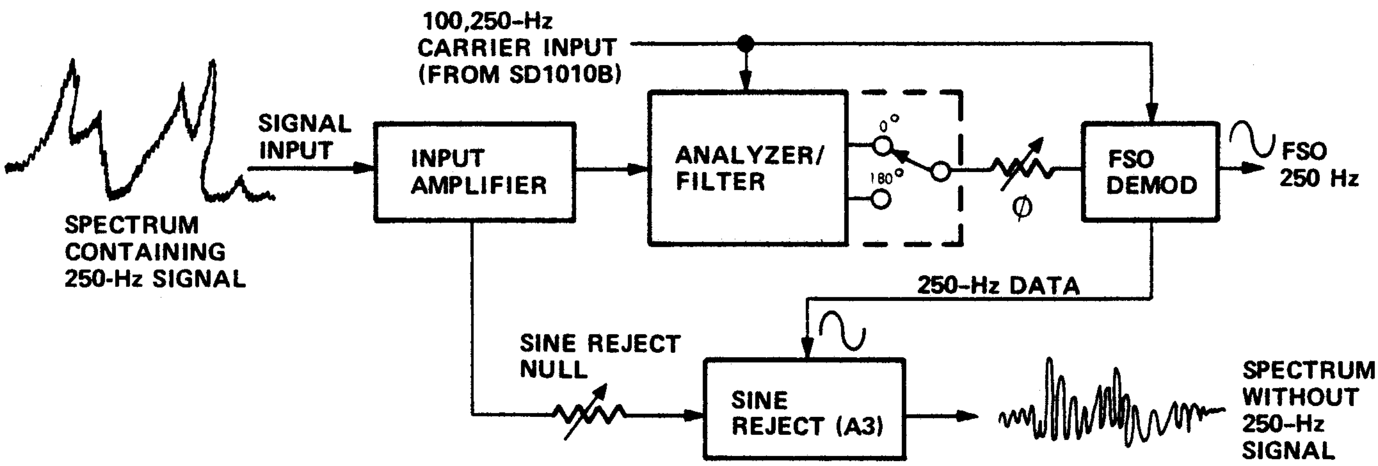


Figure 2-3. Simplified Block Diagram of Sine Reject Circuit (Channel 1)

To use a Model SD1012B-1 (or -2) for sine reject operation, interconnect the unit and all other applicable instrumentation in accordance with the particular test requirements. Then proceed as follows:

a. Power the equipment, apply proper carrier signal, calibrate the filter(s), etc. as described in paragraphs 2.2.1 through 2.2.3.

b. Perform the procedure of paragraph 2.2.4 using any frequency within the operating range of the test (2 Hz to 50 kHz).

CAUTION

To ensure proper operation, the SINE REJECT circuits should always be operationally checked immediately before a system operation.

SECTION III

CONCEPT AND THEORY OF OPERATION

3.1 CONCEPT OF OPERATION

The Model SD1012B Tracking Filter utilizes balanced modulators and a 100-kHz (plus tuning frequency) carrier signal in a patented heterodyne technique to select and translate the fundamental frequency (2 Hz to 50 kHz) from a complex spectrum into a phase and amplitude coherent 100-kHz signal. The unfiltered 100-kHz I.F. signal is filtered at selected bandwidths and then demodulated to produce the fundamental frequency (FSO – filtered signal output). Detection of the FSO and subsequent log conversion provide both linear and log d-c voltage outputs that are proportional to the input signal at the tuned frequency.

3.2 BLOCK DIAGRAM DESCRIPTION

Both channels of the SD1012B operate the same; therefore, only one channel is described here and shown in the block diagram of Figure 3-1. The following description assumes a complex SIGNAL INPUT containing a component at 250 Hz. The CARRIER INPUT signal is 100,250 Hz. The OVERLOAD indicator is not lighted. (If lighted, it indicates an overload condition exists; i.e., the input signal is 12 dB over full scale of the RANGE selected, and that an advancement to the next highest range is required.)

The data SIGNAL INPUT being analyzed is routed through the RANGE (Vrms) switch (step attenuator) to the input amplifier. The amplified signal is filtered (low pass) and applied to one input of the input balanced modulator. At the same time, the 100,250-Hz CARRIER INPUT signal is buffered and applied to the other input of the balanced modulator. The input balanced modulator translates the data signal to a phase and amplitude coherent 100-kHz intermediate frequency (I.F.) signal. The unfiltered I.F. signal is then filtered and amplified.

Each of the two filter circuits comprises three main parts: phase shifter, crystal filter, and bandwidth normalizing and filter calibration. The phase shifter provides a means for manually normalizing the input-to-output phase of the signal through each filter relative to each other, or normalizing the output phase relative to that of another unit such as an SD101B Dynamic Analyzer or another SD1012B. Front panel ϕ control provides $\approx 120°$ variable phase shift in addition to 0° or 180° phase shift that is switch selected internally.

Each filter is a plug-in type, multisection crystal lattice filter, and is contained in a temperature-controlled oven. The bandwidth normalizing and filter calibration circuits in each channel facilitate normalizing the 100-kHz I.F. output signal level over the two selectable bandwidths. The outputs of the two filter channels can be selected manually or automatically. Automatic selection is controlled by a d-c voltage proportional to the tuning frequency. (This voltage (1 volt maximum) is normally supplied by the system sweep oscillator, i.e., a Model SD104A, or from a log frequency converter, i.e., a Model SD116.)

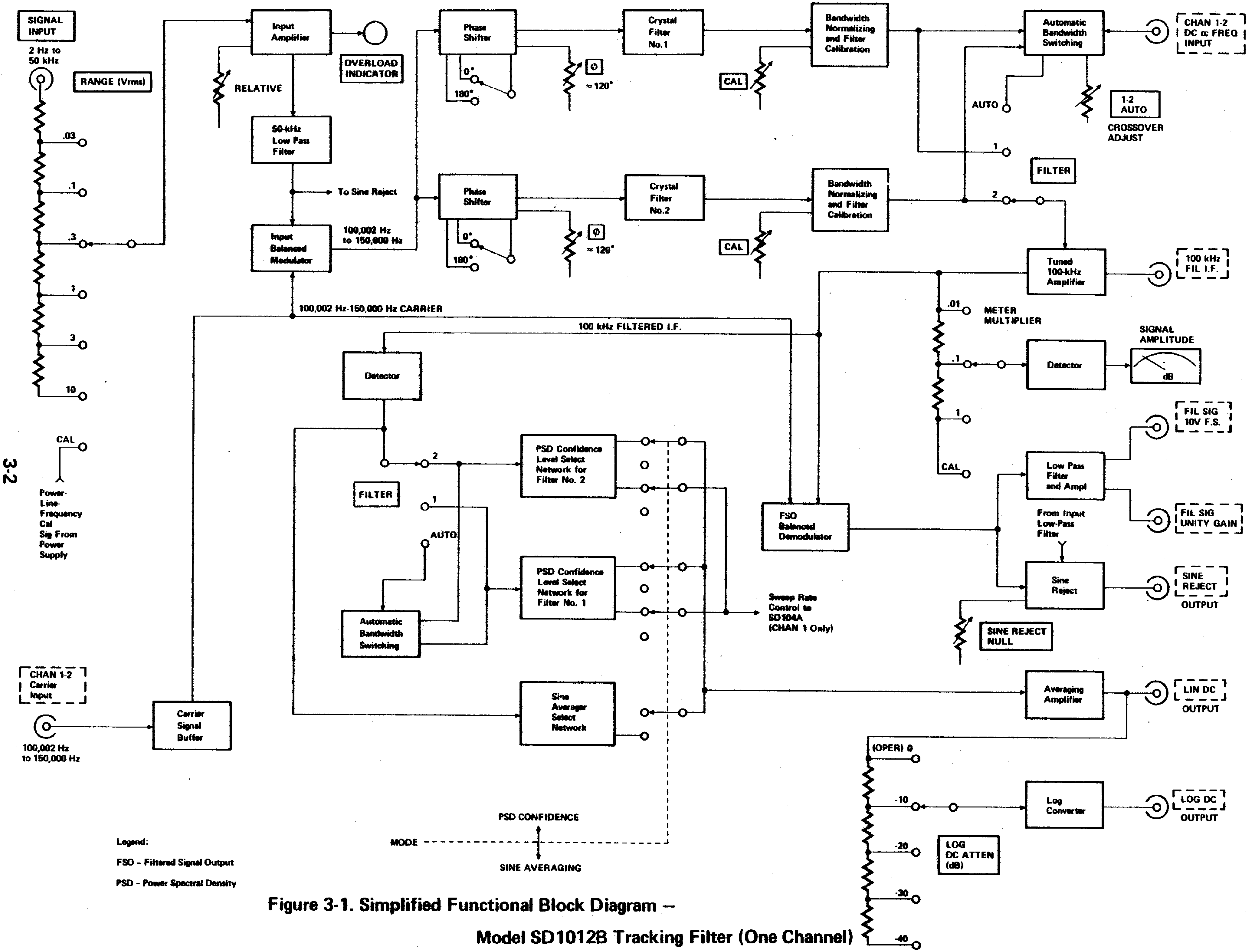


Figure 3-1. Simplified Functional Block Diagram – Model SD1012B Tracking Filter (One Channel)

The 100-kHz I.F. output from the selected filter is amplified and provided as an output at the 100-kHz FIL I.F. rear chassis connector for use in phase measurement and other applications. The amplitude of the 100-kHz filtered I.F. signal (which is equal to the amplitude of the SIGNAL INPUT at the tuning frequency) is continuously displayed on the front panel Signal Amplitude meter in both volts (rms) and relative dB level.

The 100-kHz I.F. is further processed to develop four types of outputs: a filtered signal output (FSO) at the tuned frequency, a sine reject output, and two d-c voltage outputs, a linear dc and a log dc. All outputs (except the sine reject) are proportional to the SIGNAL INPUT (at the tuned frequency). These outputs are developed as follows:

> The 100-kHz I.F. signal is combined with the carrier signal (100,250 Hz) in the FSO balanced demodulator. The FSO demodulator translates the 100-kHz filtered I.F. to a 250-Hz signal which is phase coherent with the 250-Hz signal contained in the input spectrum. The 250-Hz signal is filtered and amplified, and provided at two output levels: the FSO OUTPUT 10V F.S. provides 0 to 10V full scale over any RANGE selected; the FSO OUTPUT UNITY GAIN provides the filtered data signal at the applied INPUT SIGNAL level.

*The output of the FSO demodulator is also applied to the sine reject circuit. The SINE REJECT output signal is employed during combined sine/random testing; i.e., when both sinusoidal and random noise signals are used to excite a specimen. The SINE REJECT OUTPUT provides all accelerometer signals except the tuned frequency itself. That is, the tuned frequency (FSO), which normally exhibits the largest amplitude, is suppressed; the random signals are passed through the tracking filter at unity gain. The random signals from the SINE REJECT OUTPUT can now be further analyzed by an external filter-type analyzer/controller. The external analyzer/controller can be operated in the automatic mode without possibility of over-compression, a condition that would occur if the large amplitude tuned frequency signal were present.

The linear and log d-c voltage outputs are characterized by the type of input signal and the mode of operation; the d-c averaging time constant of the d-c outputs is a function of the MODE switch setting. Assuming the analyses of periodic data, the MODE switch is set to the desired averaging time position, SINE AVG (SEC). In this mode, a d-c voltage proportional to the data amplitude is detected from the 100-kHz I.F., filtered and averaged in the selected sine averager network, and applied to the averaging amplifier. Assuming stationary random signal inputs, the MODE switch is set to PSD CONFIDENCE (position 1, 2, 3 or 4 as desired). In this mode, the d-c output of the detector is filtered and averaged in the selected PSD confidence level select network and then applied to the averaging amplifier. Note that the proper PSD network for each filter bandwidth is selected manually or automatically as a function of the FILTER switch setting, thus giving proper averaging time constants consistent with PSD measuring techniques.

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*This circuit is optional and is included in Channel 1 of Model SD1012B-1 and in Channels 1 and 2 of Model SD1012B-2.

In either mode, the averaged d-c voltage is amplified and provided at the LIN DC OUTPUT connector. This output is linearly proportional to the amplitude of the data input signal (at the tuned frequency).

The linear dc is also applied to a log converter. This circuit provides a d-c output voltage proportional to the log of the linear d-c voltage, hence, proportional to the log of the amplitude of the input signal (at the tuned frequency). Note that when switching from the SINE AVERAGING MODE to the PSD CONFIDENCE MODE, the LOG DC output is doubled.