



Broadcast Devices, Inc.

LPF-100 Composite Low Pass Filter

TECHNICAL REFERENCE MANUAL

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Introduction

A. The LPF-100 Low Pass Filter is intended to be used in conjunction with suitable FM stereo generators and/or composite STL for the purpose of reducing the amount of noise present generated by aggressive audio processing, STL noise or unintended signals that can sometimes be generated by stereo generators.

B. Unpacking and Inspection

Carefully unpack the unit after receipt and inspect for damage that may have occurred during shipping. If damage is noted, contact the shipper immediately and file a damage claim. The contents of the package have been insured to cover total replacement cost. Make certain that the package contents are the same as noted on the packing slip. If not, contact Broadcast Devices, Inc. Check to make sure all mechanical parts are secure. Units are delivered from the factory configured for 120 volts A.C. 60 Hz. Operation. Check to make sure that the power source is correct for proper operation. Units are field configurable for 240 Volt operation. See initial configuration section of part III, installation section for different power configuration.

B. General Description

The LPF-100 accepts an FM stereo base band signal from a suitable stereo generator or studio to transmitter link receiver. The signal is fed to a 10th order linear phase low pass filter whereby signal information above 53 KHz is filtered. The unit features balanced or unbalanced input and three outputs suitable for driving 50 ohm coaxial cable. There are two outputs on the rear panel to be fed to the unbalanced or balanced input of an FM exciter and one on the front panel for test purposes.

II. Specifications

Input Impedance:	10K or 50 ohm balanced/unbalanced selectable
Output Impedance:	50 ohms unbalanced
Maximum Output level:	3.5 Volts Peak to Peak into 50 ohms
Gain:	6 dB variable
Frequency Response:	Better than +/- 0.1 dB from 10 Hz to 40 KHz -1.6 dB at 50 KHz, -50 dB at 100 KHz
Total Harmonic Distortion:	Better than 0.05% into 50 ohms
Inter - Modulation Distortion:	Better than 0.05% S.M.P.T.E. 4:1
System Noise:	Better than 80 dB below 3.5 Volts Peak to Peak
Input Connectors:	1 - Isolated B.N.C.
Output Connector:	B.N.C. (2 rear, 1 front panel)
Power Requirements:	120/240 Volts A.C. 50 - 60 Hertz
Operating Temperature Range:	0 - 60° Celsius non condensing atmosphere
Physical Dimensions:	1.75 H X 19 W X 10 D (inches)

III. Installation

A. Initial Configuration

Before installing the unit it is a good idea to decide whether or not the unit will operate balanced or unbalanced and/or bridging or terminated at its input. Generally, to avoid ground loops between equipment it is advisable to operate the unit in the balanced configuration. If for some reason it is desired to operate the units unbalanced and/or to terminate the input to 50 ohms, locate the rear panel four position DIP switch. Push the switch section marked terminate down. If unbalanced inputs are desired, push the switch position marked unbalanced down. The other two switch positions have no function on this unit. Refer to the stereo generator or STL

manufacturer's technical information to determine whether or not this equipment is capable of being terminated by 50 ohms. When termination is used a reduction of available signal will occur. This is due to the load and source impedance being matched thus reducing the signal available by half. The LPF-100 has enough gain to overcome this loss. As shipped from the factory the unit is adjusted for unity gain. To increase the gain, simply adjust the front panel control of each output for proper level feeding the exciter.

The unit as configured from the factory is set to accept 120 Volts A.C. 60 Hertz electrical power. To change the power setting, first remove the power cord from the power entry connector. Slide the plastic cover to the left and with a pair of long nosed pliers carefully remove the power select p.c. board from the power entry module. Select the desired power configuration by placing the power entry p.c. board back into the module so that the desired power setting can be read from left to right.

B. Location and Hookup Considerations

Locate the LPF-100 in a 19-inch E.I.A. standard rack enclosure in close proximity to the equipment that it is going to interface between. Allow sufficient airflow space between equipment to allow for proper cooling. It is important that the cables being fed from composite sources such as stereo generators and STL receivers be kept as short as is practical. The LPF-100 can drive lines at least as long as 25 feet with no degradation of signals. It is advisable to keep all cable lengths as short as possible to prevent stray R.F. pick up.

C. Composite Connections and Adjustments

Make all desired input and output connections to your external equipment. Make sure that the LPF-100 is plugged in to a properly grounded A.C. receptacle. If possible, interrupt the audio feeding the LPF-100 and measure the signal to noise ratio with a suitable voltmeter. If the noise measurement obtained is acceptable you can proceed to the final adjustment of the unit. If the noise is high there may be stray R.F. pick up or a ground loop. It is a good idea to listen to the system with a suitable audio monitor to determine the source of the noise. Hum is a common noise present. If hum is present, start by removing one cable at a time to determine the source of the ground loop. If the hum disappears or changes level when a cable is disconnected, a loop exists between the LPF-100 and the equipment at the other end of the cable removed. This will generally not happen with an input unless the unit has been configured for unbalanced operation. If this is the case, try the balanced input mode of operation. If a ground loop is present between the LPF-100 and an exciter or STL, feed the LPF-100 to a balanced input. Most modern exciters accommodate balanced cables.

Note: Do not feed SCA, RBDS signals through the LPF-100 as they will be attenuated. The LPF-100 is intended only for stereo base band signals. You must plan the routing of SCA and/or RBDS signals around the LPF-100 for proper injection level to the exciter.

D. Composite Loop Out Connection

The LPF-100 is equipped with a loop out connection. The signal present at this connection is the signal fed to the input of the unit before filtering. This connection is provided if it is desired to have an unfiltered signal source available. It is recommended that if this output is used that the input termination switch be left up in the bridging position.

E. Stereo Generator Alignment

Once the connections have been completed to the unit it is recommended that the respective manufacturers' instructions for aligning the stereo generator be followed. Addition of the LPF-100

may have an impact on the L=-R gain and the 19 KHz stereo pilot phase. Most modern stereo generators have a range of adjustment of the L=-R gain and 19 KHz pilot phase to compensate for transmission path amplitude and phase distortions introduced. A general procedure is given below but it is strongly suggested that you obtain a copy of the technical information for your stereo generator to follow the proper procedure.

General Stereo Generator Alignment procedure:

This procedure should be followed with the LPF-100 installed just before the composite inputs of the exciter that it will be feeding with all other equipment in the signal path as it will be used on the air. Failure to do this will result in misalignment of the system which can result in poor stereo separation and or impaired signal to noise ratio.

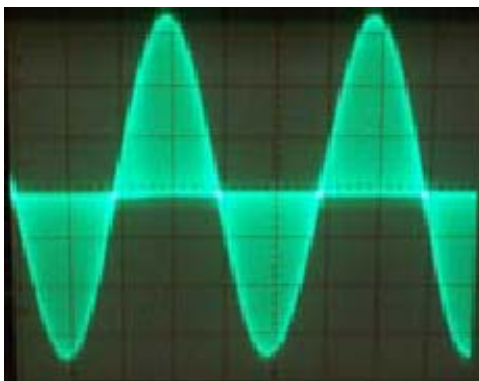
The following test equipment is required for the following procedure:

1. Audio Oscillator
2. Oscilloscope with a vertical amplifier response of at least 500 KHz.

Left = - Right Gain adjustment:

The best way to insure proper performance is to monitor the stereo base band signal from the output of a modulation monitor or wide band output of a suitable FM demodulator. The modulation monitor RF input should be connected to a suitable directional coupler in the transmitter RF output line. Attach the oscilloscope to a base band output of a modulation monitor and adjust the vertical input so that the entire signal can be displayed from top to bottom on the scope screen.

Feed a 50 hertz left or right only signal to the input of the stereo generator and observe the oscilloscope waveform. The waveform will resemble a sine wave with a filled in area under the curve. Carefully observe the base line. It should be flat. If it is concave or convex shaped adjust the L=-R gain control until the base line is flat. The base line may appear to be thick this is the 19 KHz pilot riding on the base line. Refer to the figure below for a properly adjusted base line.

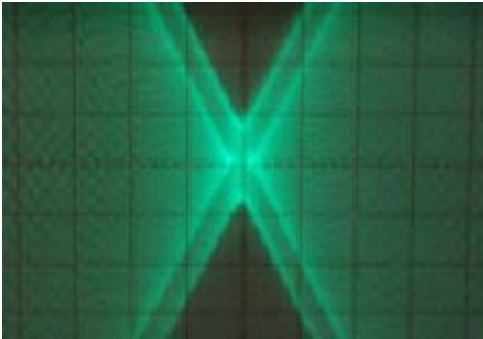


A properly adjusted L=-R gain adjustment 50 Hertz Left Only - Pilot has been removed

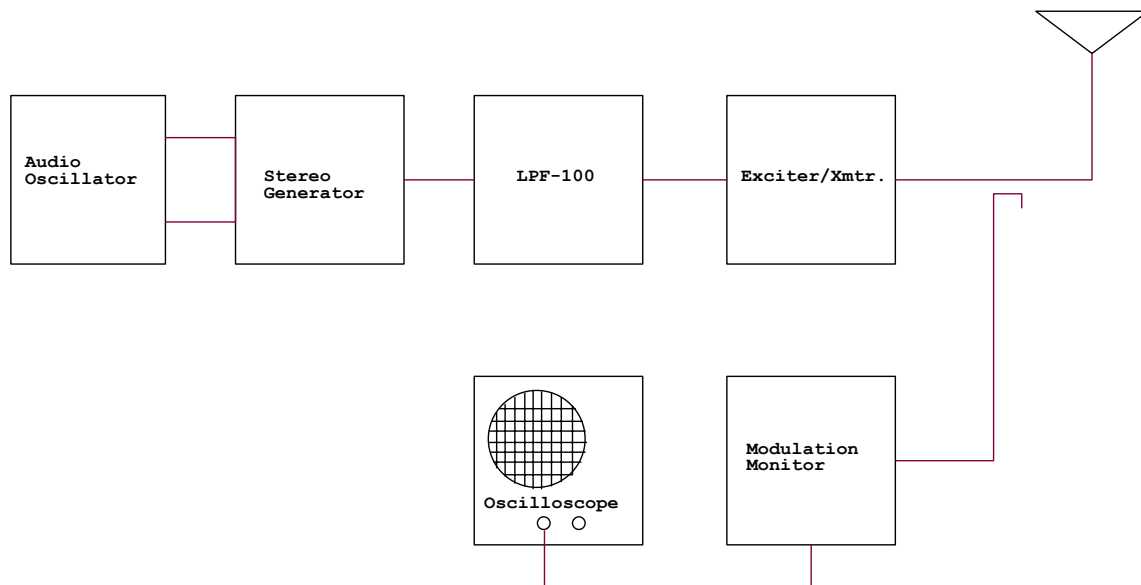
Pilot Phase Adjustment

Feed a 50 Hertz audio signal to both left and right inputs of the stereo generator but out of phase. Observe the oscilloscope and note that you should see a pattern that resembles a butterfly. Adjust the sweep of the scope so that the intersection of the butterfly "wings" is observed in the middle of the scope screen. Adjust the vertical amplifier so that it is easy to observe the center of the butterfly. Observe the 19 KHz pilot phase by observing the two triangular tips that point to one another. If the pilot is properly adjusted the tips will be on the same horizontal line in the center of

the scope screen. If they do not line up horizontally the pilot phase will need to be adjusted. Adjust the pilot phase so that the two tips meet horizontally.



A properly adjusted pilot phase indication as observed on an oscilloscope.



Suggested Equipment Setup for stereo generator alignment

IV. Warranty

Broadcast Devices, Inc. products are warranted against failure due to faulty materials or workmanship for a period of one year from the date of shipment to the ultimate user. The warranty covers repair or replacement of defective parts at the factory, provided the unit has been returned prepaid by the user. All shipments to the factory shall have affixed to the outside of the container an R. A. number obtained from the factory. The above warranty is void if the unit has been modified by the user outside of any recommendations from the factory or if the unit has been abused or operated outside of its electrical or environmental specifications. If customer conducted field tests suggest that the unit may be faulty, whether or not the unit is in warranty, a full report of the difficulty should be sent to Broadcast Devices, Inc. factory at Cortlandt Manor, New York. The office may suggest further tests or authorize return for factory evaluation.

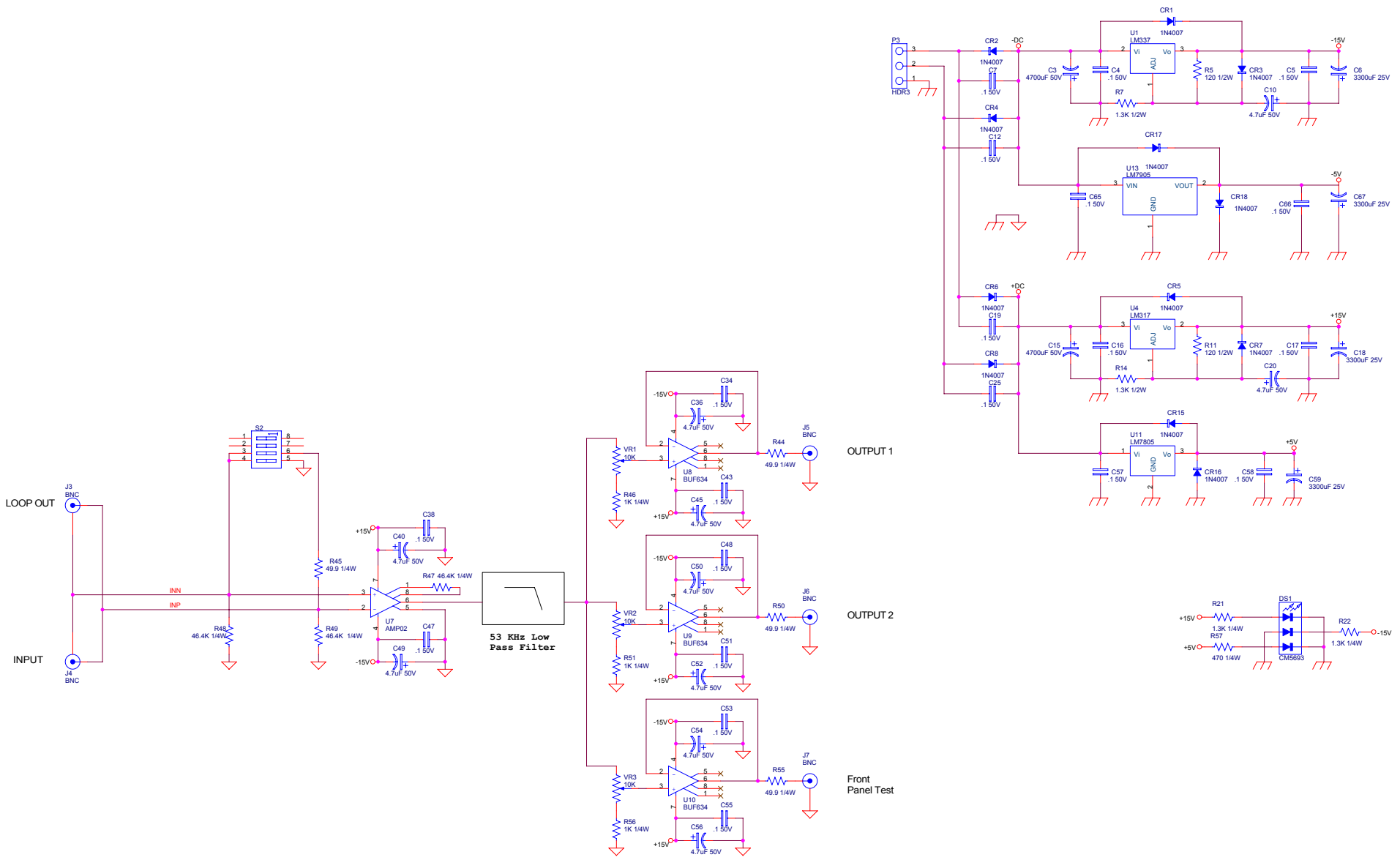
Units sent to the factory should be well packed and shipped to Broadcast Devices, Inc. 5 Crestview Avenue, Cortlandt Manor, NY 10567. Remember to affix the R.A. number to the outside of the carton. Any packages received without such R.A. number will be refused. Note: freight collect shipments will also be refused. When the unit has been received, inspected and tested, the customer will receive a report of the findings along with a quotation for recommended repairs, which are found falling outside of the standard warranty. Units returned for in-warranty repairs which are found not to be defective will be subject to an evaluation and handling charge. In-warranty units will be repaired at no charge and returned via prepaid freight.

Out-of-warranty units needing repair require a purchase order and will be invoiced for parts, labor, and shipping charges.

When ordering replacement part, always specify A) Part number or Description, and Quantity; B) Date of Purchase, Where Purchased; C) Any Special Shipping Instructions. Always specify a street address, as shipping companies cannot deliver to a postal box.

Broadcast Devices, Inc. is not responsible for any other manufacturer's warranty on original equipment. Nor are we responsible for any failure, damage, or loss of property that may occur due to the installation or operation of our equipment outside of recommended specifications.

V. Diagrams



NOTE: ALL RELAYS SHOWN IN "POWER OFF" STATE

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