PSA-65A

PORTABLE SECTRUM ANALYZER

Preliminary Operating Instructions

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Preliminary Operating Instructions for AVCOM's

PSA-65A Portable Spectrum Analyzer

Whether you are a technician or engineer who is thoroughly versed in the applications of a spectrum analyzer or someone who has never used one, you will be surprised by the ease of operation and versatility of the PSA-65A. Usually when a spectrum analyzer is purchased, the customer has a specific application in mind however, as you become more familiar with the characteristics and performance of the PSA-65A, the number of applications will increase. The lightweight, battery or line operated PSA-65A portable spectrum analyzer from AVCOM is the perfect instrument for field testing of RF systems, classroom instruction, satellite system alignment, electronic countermeasures, cable TV maintenance, cellular and production use.

TABLE OF CONTENTS

PSA-65A SPECIFICATIONS

FREQUENCY COVERAGE
2 MHz to 1000 MHz in one sweep.
200 KHz to 1000 MHz when optional 10 KHz Res B.W. installed.

RESOLUTION BANDWIDTH
Automatically selectable by Span Control

a) 3 MHz Res B.W. (set span at 100 MHz/Div)
b) 1 MHz Res B.W. (set span at 50 MHz/Div)
c) 300 KHz Res B.W. (set span at 10 MHz/Div)
d) 150 KHz Res B.W. (set span at 5 MHz/Div)
e) 75 KHz Res B.W. (set span at 1 or .2 MHz/Div)
f) Optional 10 KHz Res B.W. (set span at .2 MHz/Div)
Extends lower frequency range to approximately 200 KHz

Note: A Narrow Band Cavity Oscillator is swept for .2 MHz/ Div span so that signals can be observed with low oscillator noise contribution.

REFERENCE LEVELS
+20, 0, -20, -40 dBm / +69, +49, +29, +9 dBmv

INPUT CONNECTOR
Type BNC (BNC to F adapter included)
Type N (optional)

DISPLAY
10 horizontal graticule Divisions (frequency) x 7 vertical graticule Divisions (amplitude). Each vertical Division equals 10 dB or 2 dB.

SENSITIVITY
-95 dBm

AMPLITUDE ACCURACY
+ 2 dB typical

FREQUENCY DISPLAY
4 digit LCD Frequency Readout

DIMENSIONS
11.5"W x 5.5"H x 13.5"D

WEIGHT
18 Lbs / 8.18 Kg

POWER REQUIREMENTS
External 115 VAC 60Hz / 12 VDC
Internal 12V Gel Cell Battery
220/240 Volt models available

ACCESSORIES
1-2 GHz Frequency Extender
2-3 GHz Frequency Extender
950-1450 MHz Frequency Extender
3.7-4.2 GHz Frequency Extender
RFP-24 Preamplifier
DCP-20 DC Power Inserter / Block
AVSAC Carrying Case
LPA-1000 Log Periodic Antenna

OPTIONS
FM Demodulator
AM Audio Detector
X-Y Oscilloscope Output
20 KHz - 10 MHz Band
10 KHz Resolution Bandwidth

FRONT PANEL FUNCTIONS

1. **POWER**

   POWER SWITCH - The POWER switch has three positions; BATtery operation, STandBY, and LINE operation.

BAT - Turns instrument on and instrument is powered by internal rechargeable battery pack. **NOTE**: An INTERNAL / EXTERNAL battery switch and EXTERNAL POWER jack are located on rear panel of the PSA-65A. When placed to "EXTERNAL" position, an external 12 VDC power source can provide power to the PSA-65A.

STBY - Amber LED is illuminated if line cord is connected to AC power source. Instrument is functionally off although power is present inside chasis. **NOTE**: In this position, the battery charger is operational and the internal battery pack can be re-charged.

LINE - Turns the PSA-65A on. All power is being provided by the AC line source.

2. **BAT CHG**

   The BATtery CHarGer is connected to internal battery pack when this switch is in the "ON" position. An amber LED is illuminated while battery charger is on. **NOTE**: For proper battery charger operation, the PSA-65A POWER switch should be in the "STBY" position. Then the PSA-65A will be recharged to approx. 80% in 6 hours and 100% when left on charge overnight.

3. **INTENS**

   The INTENSity control sets the intensity of the trace.

4. **HORIZ POSITION**

   The HORIZontal POSITION control positions the sweep horizontally on the screen. When properly adjusted, a signal located at the center of the screen will remain in the center of the screen in any SPAN position.

   TO SET: IT IS VERY IMPORTANT TO LEARN THIS CALIBRATION PROCEDURE. Position the VARSPAN control at "CAL", and using the TUNING control, place a signal in the center of the display. Then "expand" the signal spike by rotating the VARSPAN control counter-clockwise. If the HOR POS control is not properly calibrated, the signal spike will move to the right or to the left. Adjust the TUNING control to keep the signal spike centered in the display until the VARSPAN control is almost fully counterclockwise. After this condition is reached, rotate the VARSPAN control clockwise back to CAL. If the horizontal position control needs adjustment, the signal spike will seem to be displaced to the left or to the right of the graticule. Now, adjust the HOR POS control to place the signal back in the center of the screen. You may want to repeat this procedure and to perform it at narrow sweep widths for maximum accuracy of the frequency readout. It is essential to check this adjustment every operating session.

5. **AUDIO OUT JACK**

   Drives a low impedance earphone or speaker when the AUDIO DEMODulator is turned on. Using this jack disconnects the internal speaker.

6. AUDIO DEMOD

This control activates the AUDIO DEMODulator circuit and controls the output level of the demodulated audio output. **NOTE**: Audio can only be heard when the ZERO SPAN toggle switch is placed in either the "AUDIO" or MOMENtary" position.

7. AUXILARY CONNECTOR

This AUXiliary socket supports present and future optional accessories for the PSA-65A.

8. RF INPUT

This BNC connector accepts RF signals to signals to be observed from less than 2 MHz to greater than 1000 MHz.

9. SPAN

The SPAN control sets the scale of the horizontal sweep presentation from 1000 MHz (100 MHz/div) to 2 MHz (.2 MHz/div). This control also automatically selects the optimum IF resolution filter.

10. VAR SPAN

The VARiable SPAN control reduces the width of the spectrum being displayed for closer signal examination and enhances amplitude accuracy.

11. ZERO SPAN

ZERO SPAN instantly places the analyzer into the zero span mode and activates the audio demodulator for convenient signal monitoring.

AUDIO - (Upward position and switch remains in this position until manually pushed again). This position switches on the demodulator circuit until the ZERO SPAN switch is returned to the NORMal position.

NORM - This is the normal position of the ZERO SPAN switch when not monitoring audio signals.

MOMEN - This is a momentary switch position that instantly places the analyzer into the zero span mode and activates the audio demodulator for convenient signal monitoring.

12. TUNING

This multi-turn control adjusts the center frequency of the analyzer so that signals of interest appear at the center of the display. The center frequency is also displayed by the LCD display.

13. FINE TUNE

FINE TUNE allows for fine adjustment of the center frequency. Greater adjustment range is on the left side of the control (-) and finer adjustment range is on the right side of the control (+).

14. CENTER FREQUENCY

The CENTER FREQUENCY is displayed by a 4 digit LCD display that permits frequency measurements accurate to 100 KHz. **NOTE**: For accurate frequency measurements, the PSA-65A must be in ZERO SPAN.

15. VERTICAL POSITION

Controls the position of the sweep.

TO SET: With no signal present, the "REFERENCE LEVEL" switch set to 0 dBm, the SPAN control set to 50 MHz/div, and the VARSPAN control tuned to the "CAL" position, adjust the sweep to be centered between the two small "tic" marks located between -60 and -70 dBm at the bottom of the display.

16. VERTICAL SENSITIVITY

Used to select vertical amplitude sensitivity of either 10 dBm/div or 2 dBm/div. Normally this switch should be in the "10 dBm/div" position. The 2 dBm/div is most helpful when observing very small signals.

17. SWEEP RATE

SWEEP RATE controls the speed of the horizontal sweep across the CRT display. For general observation, a sweep rate just fast enough that "trace flicker" disappears should be used. For accurate amplitude measurements the sweep rate should be set to the slowest rate. Generally, the sweep rate should not be set to the fastest rate (fully clockwise).

PSA-65A USER FAMILIARIZATION
AND
PRELIMINARY CHECKOUT

BATTERY PACK CHARGING

IMPORTANT - Charge battery a minimum of three hours before operation on battery. 80% or more charge will occur after six hours of charge. DO NOT CHARGE OVER 24 HOURS between discharges or battery life may be shortened.

1. Place POWER switch into STBY position.

2. Plug PSA-65A into a grounded outlet of correct voltage.
   NOTE: Amber STBY LED is illuminated.

3. Turn BAT CHG to "ON" position.
   NOTE: Amber LED is illuminated.

INITIAL TURN-ON & SETUP

1. Turn POWER switch to "LINE" and set the INTENSity control to approx. 80% of fully clockwise position.

2. Center the HORIZontal and VERTICAL POSITION controls.
   After 30 seconds, a trace should appear on the screen.

3. Set up the analyzer controls as follows:
   REFERENCE LEVEL to 0 dBm
   SPAN control to 100 MHz/div.
   VAR SPAN control to CAL position (Fully clockwise)
   SWEEP Rate to 3 o'clock position.
   VERTICAL SENSITIVITY to 10 dB/div.
   ZERO SPAN toggle switch to the NORMal position.
   FINE TUNE control to mid position
   CENTER FREQUENCY to 500 MHz using the TUNE control.

4. At this time a sweep should be displayed on screen with a large vertical spike (zero frequency) at the far left side of the display. NOTE: This large signal is ZERO FREQUENCY and is normal for all spectrum analyzers. (The first LO frequency is equal to the first IF frequency at that point).

VERTICAL CALIBRATION

1. Adjust the VERTICAL POSITION control so that the sweep trace is centered between the "Tic" marks between -60 amd -70 dBm. The vertical deflection is now calibrated with the

top grid line of the display equal in amplitude to the setting of the REFERENCE LEVEL control.

HORIZONTAL CALIBRATION

1. Position the VAR SPAN control at "CAL" and using the tuning control, place a signal in the center in the display. The signal can be an off-the-air signal (set REF LEVEL to -40 dBm for maximum sensitivity and connect a simple antenna to RF INPUT) or the zero frequency spike. "Expand" the signal spike by rotating the VAR SPAN control counter clockwise. The signal spike may move to the right or to the left. Adjust the TUNING control to keep the signal spike centered in the display until the VAR SPAN control is almost fully counterclockwise. Then rotate the VAR SPAN control clockwise back to CAL. If the HORIZ POSITION needs adjustment, the signal spike will be displaced to the left or to the right of the center of the graticule. Adjust the HOR POS control to place the signal back in the center of the screen. You may want to repeat this procedure and to perform it at narrow sweep widths for maximum accuracy of the frequency readout. It is essential to check this adjustment for maximum frequency accuracy.

CONCLUSION

1. Note the position of the VERTICAL, HORIZontal, and INTENSity controls so the PSA-65A can be put into service rapidly the next time it is used.

2. This completes the User Familiarization and Preliminary Checkout of the PSA-65A.

HORIZONTAL POSITION CONTROL ADJUSTMENT

CUSTOMER NOTE !!!
Important information to all users of the PSA-65A Portable Spectrum Analyzer !!!

It is very important that the HORIZ POSITION control of the PSA-65A be properly calibrated before each use. Failure to do so may result in inaccurate center frequency readout and signal spikes "moving" away from center of the screen as span adjustments are made.

HORIZONTAL POSITION CONTROL ADJUSTMENT: (Detailed)

Horizontal position control adjustment takes approximately 10 seconds once user becomes familiar with procedure. Turn instrument on and preset all controls as in initial set up procedure.

Choose a signal off air or from a signal source. Set the span control to 5 MHz/div. Using the TUNING CONTROL to center this signal in the center of the display (by center of the display we mean the center of the horizontal axis represented by the vertical gratitude line with many small tic marks on it. We are only interested in left and right movements of the trace. Do not be concerned with the vertical trace movements).

Next, narrow the span by slowly rotating the VAR SPAN control counterclockwise towards zero span. If the HORIZ POSITION control requires adjustment, the signal spike will shift to the left or right of the center frequency line as you rotate the VAR SPAN control. If the signal spike shifts off the center frequency line, adjust the tuning control to place it back in the center of the display. Continue rotating the VAR SPAN control adjusting the CENTER FREQUENCY control as necessary until the spike becomes very wide. The objective of this step is to position the expanded signal spike exactly in the center of the display.

Now, without touching any control except the VAR SPAN control, rotate it fully clockwise to the CAL position. Watch the signal spike as you do this. It will become narrower and will probably shift to left or right of the center frequency line. Finally adjust the HORIZ POSITION control to place the signal spike back in the center of the display. Verify calibration is correct by again rotating the VAR SPAN control toward zero. The signal spike should get wider but should not shift appreciably on display.

HORIZONTAL POSITION CONTROL ADJUSTMENT: (Abbreviated)

1. Preset instrument controls for initial operation.

2. Obtain signal spike on the display from off air or signal source.

3. Place signal in middle of display with TUNING control.

4. Set span control to 5 MHz/div.

5. Rotate VAR SPAN control slowly counterclockwise while adjusting TUNING control to keep signal spike centered on display. Turn VAR SPAN until signal spike becomes fairly wide.

6. Now, turn VAR SPAN control clockwise back to CAL. Watch the signal spike you've been working with and note where it moves.

7. Now, adjust HORZ POSITION control to move signal spike to center of display.

8. Verify adjustment has been performed correctly.

LIMITED WARRANTY

AVCOM OF VA, INC. warrants to the original purchaser that this spectrum analyzer shall be free from defects in workmanship for one hundred eighty days from the date of original purchase. During this warranty period AVCOM OF VA, INC. will provide free of charge both parts and labor necessary to correct defects in workmanship.

AVCOM OF VA, INC. additionally warrants to the original purchaser that this product shall be free from defects in material until one year after the date of original purchase. During this additional warranty period, AVCOM OF VA, INC. will provide free of charge the parts necessary to correct defects in material. Labor charges are not included and will be based on current rates if product diagnosis, repair, alignment, or inspection is required.

THIS WARRANTY DOES NOT INCLUDE batteries or cathode ray tubes. AVCOM OF VA, INC. cannot control the environment or usage of these components and therefore the customer is solely responsible for any cost of labor or material in conjunction with their maintenance and/or replacement.

To obtain this warranty service, the original purchaser must:

(1) Notify AVCOM OF VA, INC. if a possible defect is discovered, with the following information:
    (a) The model number and serial number.
    (b) A detailed description of the problem, including details of electrical connections to associated equipment and list such equipment.
(2) Obtain a verbal authorization from AVCOM OF VA, INC. in order to return the spectrum analyzer for warranty repair.
(3) Deliver the spectrum analyzer to AVCOM OF VA, INC. or ship the same in its original container or equivalent, fully insured and shipping charges prepaid.

Correct maintenance, repair, and use, are important to obtain proper performance from this product. Therefore, carefully read instructions provided. This warranty does not apply to any defect that AVCOM OF VA, INC. determines is due to:

(1) Improper maintenance or repair by unauthorized personnel, including the removal of factory seals or rivets, or the installation of parts or accessories that do not conform to the quality and specifications of the original parts.
(2) Misuse, abuse, lightning, alteration, neglect, or improper installation.

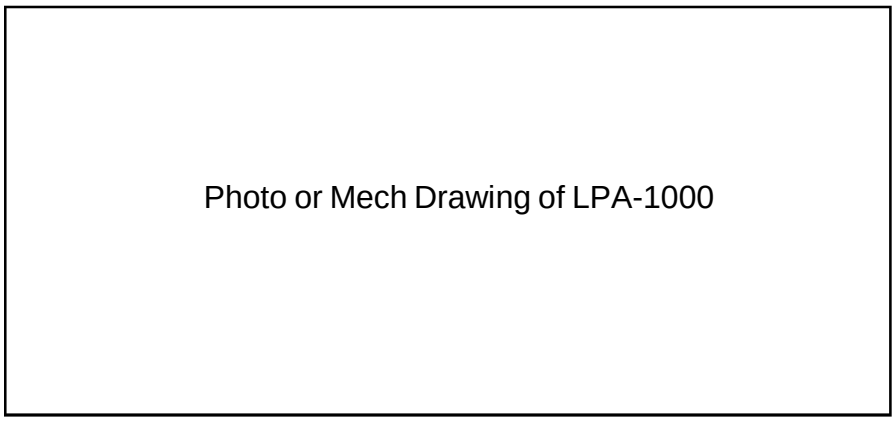
All implied warranties, if any, terminate one hundred eighty days from the date of the original purchase.

The above constitutes AVCOM OF VA, INC.'s entire obligation with respect to this product, and the original purchaser and any user or owner shall have no other remedy and no claim for incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation and exclusion may not apply to you.

This warranty gives specific legal rights and you may also have other rights which vary from state to state.

Manufacturer reserves the right to change specifications or design of this pruduct without notice.

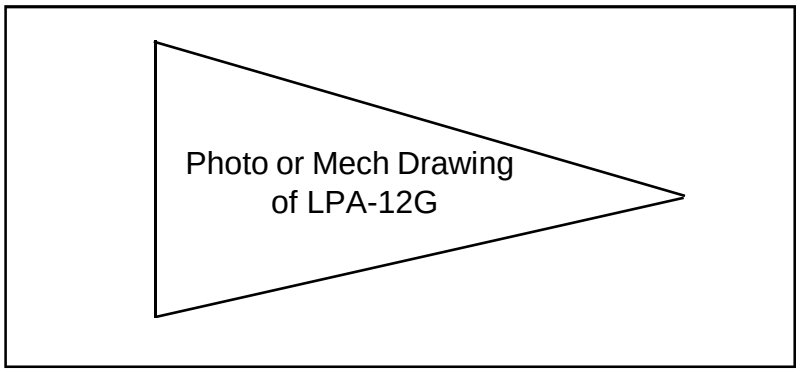
PSA-65A ACCESSORIES



A. LPA-1000 LOG PERIODIC ANTENNA

AVCOM's LPA-1000 is a high performance precision-machined log periodic antenna for the PSA-65A, as well as for use with other equipment. The LPA-1000 covers a frequency range from 140 MHz through 1200 MHz. The LPA-1000 is only 49 inches (125 cm) in length and weighs 4 lbs. (1.8 kg). A BNC connector is standard.

Technical specifications for the LPA-1000 include an approximate gain of 6.55 dB and a typical front to back ratio of 15 dB.



B. LPA-12G LOG PERIODIC ANTENNA

AVCOM's LPA-12G is a log ....1-12GHz...Countrmeasures...Small Portable... Hand Held

C. RFP-24 RF PREAMPLIFIER

AVCOM's high performance RF preamplifier, the RFP-24, was designed to enhance the performance of the LPA-1000 log periodic antenna, and for other applications where low noise signal amplification is required. The RFP-24 dramatically improves the sensitivity of any spectrum analyzer or frequency extender to frequencies in excess of 2GHz. Used with AVCOM's PSA-65A portable spectrum analyzer, signals weaker than one microvolt can be detected.

Technical specifications for model RFP-24 include 22 dB gain through 2 GHz, noise figure of 2.2 dB at 1.2 GHz, a VSWR of 2.5:1, and 50 ohms input and output impedance. Power may be supplied by the PSA-65A front panel AUX jack or any source of 12 VDC.

The RFP-24 preamplifier is packaged in a machined aluminum block with dimensions of 1.25"x1.00"x.75". Customer may specify input and output connectors to be SMA, BNC, N, or F of any gender.

See page __ for usage drawings of the RFP-24 and DCP-20.

D. DCP-20 DC POWER INSERTER

AVCOM introduces an addition to their line of DC power inseters, the model DCP-20. The versatile DCP-20 can be used as a DC block or as a means of inserting power into a coaxial transmission line.

One important application is to remotely power AVCOM's RFP series of preamplifiers through the feedline so the amplifiers may be located at the antenna to eliminate coax losses.

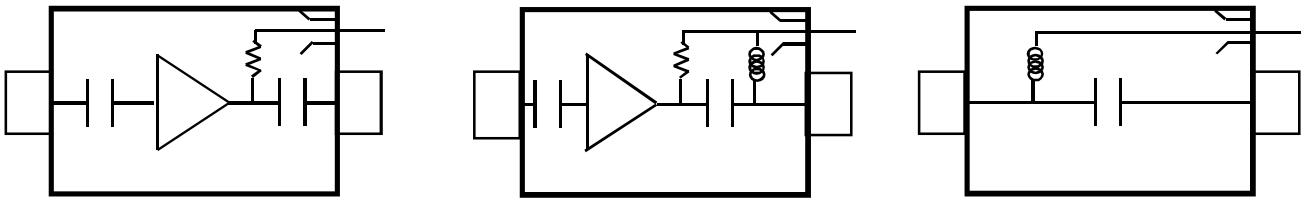
Users of expensive test equipment, such as signal generators and spectrum analyzers, can prevent costly attenuator and mixer burnout (from misconnected power supply leads, shorted DC blocking capacitors or carelessness) by use of the DCP-20 on RF ports.

Insertion loss of the DCP-20 is less than .3 dB through 2 GHz with an impedance of 50 ohms. Other impedances may be specified by the customer. The DCP-20 may be ordered with any mix or gender of SMA, BNC, N and F type connectors.

The DCP-20 is packaged in a machined aluminum block with dimensions of 1.25"x1.00"x.75".

See page __ for usage drawings of the DCP-20 and RFP-24.

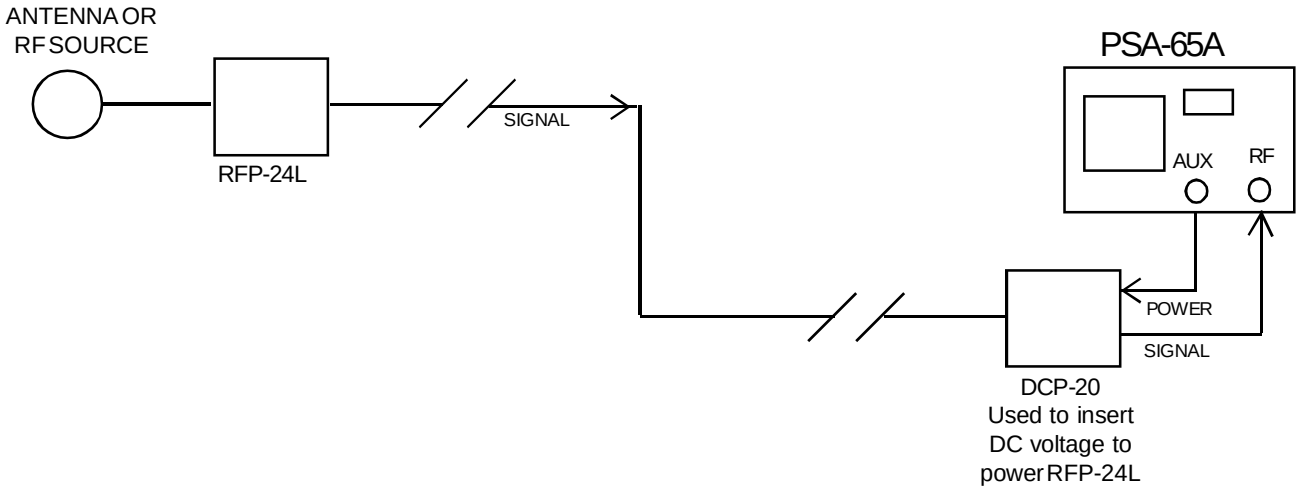
Block Diagrams Demonstrating the use of AVCOM's DCP-20 and RFP-24



RFP-24
Line Amplifier

RFP-24L
(In line or externally powered)

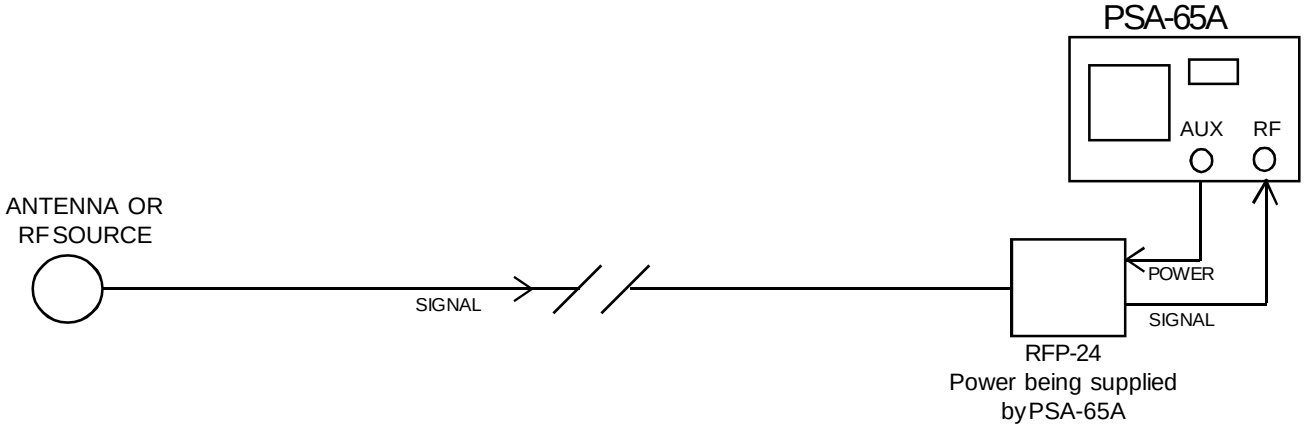
DCP-20
DC Block

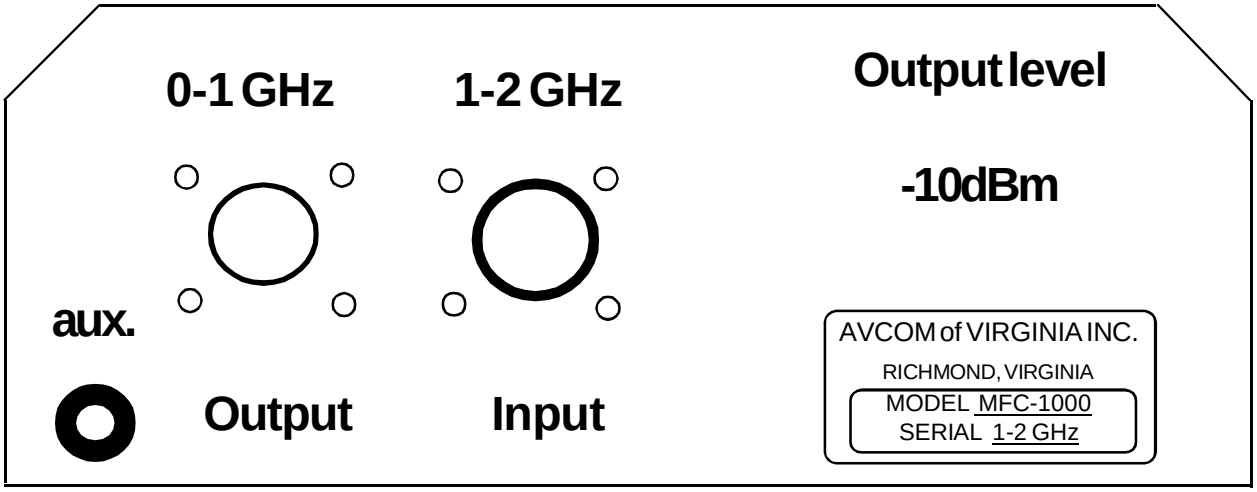


Technical specifications for the RFP-24 preamplifier include 22dB gain through 2GHz, noise figure of 2.2dB at 1.2GHz and 50 ohm input and output impedance.

**** NOTE** A complete choice of connectors is available on these products including type N, BNC, SMA, F - both male and female.

WARNING Applying external power to the RFP-24L will place DC voltage on the coax which may cause damage to test equipment if it is not properly DC blocked.





Operating Procedures for PSA-65A Frequency Extenders

1. Plug DIN connector into AUX. jack on the front panel of the PSA-65A. This will provide power to the Frequency Extender and make the Frequency Counter of the PSA-65A read correctly.

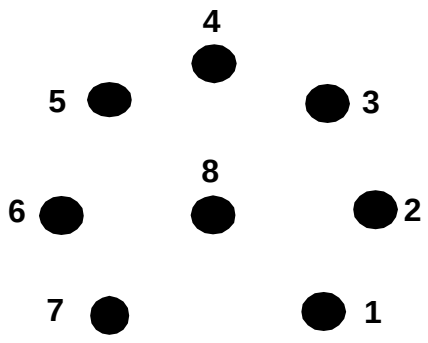
2. Connect a cable from the 0-1 GHz (Output) connector on the Frequency Extender to the RF INPUT connector on the PSA-65A.

3. Connect your input signal to the N connector (marked Input below the N connector and the ordered frequency range above the connector) and take readings and measurments off of the PSA-65A. Please note that the amplitude of the signals will be reduced by 10 dBm due to conversion loss.

PSA-65A AUX Jack Pin Identification

Front View

Pin 1 connected to pin 8 yields 1000 to 2000 MHz...
Pin 1 connected to pins 2 & 8 yields 2000 to 3000 MHz...
Pin 1 connected to pins 3 & 8 yields 3000 to 4000 MHz...
Pin 1 connected to pins 3, 4 & 8 yields 3430 to 4430 MHz...
Pin 1 connected to pins 4 & 8 yields 1500 to 2500 MHz...
count on frequency counter LCD.
Pin 6 is unregulated power
Pin 8 is ground
Pins 5 & 7 no connection at present time



62MHz OUTPUT OPTION FOR THE PSA-65

Requirements include an external TV capable of tuning 60 MHz (Channel 2), antenna cable adapter to run from the PSA-65 output to the TV antenna input, then thru a coax (RG-174 suggested) to the TV antenna connector, which may be a 300-75 ohm matching transformer, (ie: screws on one side and a 1/8 PHONO plug on the other side).

For normal operation, hook up the TV thru the above mentioned cable assembly. Turn the tuning control of the TV near VHF Channel 2, connect desired input to the Spectrum Analyzer and tune PSA-65 to the video frequency of interest. If the signal is an off air TV signal that has audio carrier next to the video carrier, the optimum point to tune is between the two carriers. Switch the analyzer to zero span with the detent span at 100 or 125 MHz per division. Switch the RF INJECTION switch to "low". The picture and sound of the Center Frequency signal seen on the analyzer should now be fine tuned on the TV for best picture and sound. The RF INJECTION switch may be switched to "high", which may improve TV reception, fine tune the TV if necessary. The high and low injection of RF INJECTION switch simply turns on either a 50 or a 72 MHz oscillator that mixes with the analyzer's 10.7 MHz IF, which results in the 60 MHz output. In the case of "high" injection, it gives a mirror image of the IF signal, if the audio was to the right of the video signal as normal, the output would have the audio before the video.

PSA-65A BATTERY PACK REPLACEMENT PROCEDURE

1. Use a 1/8 inch diameter drill bit to drill out the top rivet on the side of the PSA-65A. Drill only the head and do not attempt to drill all the way through.

2. Remove the four (4) cover screws and cover.

3. Find black foam fastened inside the case behind rivets. Remove and save foam, cover rivet with putty or gum to trap metal particles and drill out remainder of rivet. Once rivet is removed reinstall foam.

4. Remove Battery fuse in the rear panel and make sure that the PSA-65A is unplugged.

5. Unplug connectors on top power supply. MAKE NOTES TO ENSURE CORRECT REASSEMBLY.

6. Remove the four hold down screws in the top power supply and lift board exposing the lower power supply. Remove connectors, MAKING NOTES FOR RECONNECTION. Remove both sets of standoffs, hinged and hex.

7. Remove insulating plastic and all connecting wires on the battery pack. To prevent accidental discharge, or short, remove negative (black) lead first. AGAIN NOTE LOCATION OF DISCONNECTED WIRES FOR REFERENCE IN REASSEMBLY. ALSO NOTE POLARITY CODES OF THE BATTERIES.

8. Remove the screws on the bottom panel that hold the battery access panel on.

9. Install new batteries facing in the same direction as the old batteries.

10. Reinstall screw in the bottom of instrument to hold battery access panel.

11. Reinstall wires to battery pack. Use notes prepared in step “7”.

12. Replace insulating plastic.

13. Set lower power supply back in place and reinstall four standoffs.

14. Reconnect connectors to proper places being sure that pins are connected. Correct alignment is important. Connecting connectors one pin to the left or right may result in damage to the PSA-65A. Use notes prepared in step “5”.

15. Set upper power supply in place and reinstall four 6-32 screws. Reconnect connectors with caution as before.

16. The battery voltage should be checked at the rear panel INTERNAL / EXTERNAL slide switch from inside the PSA on the exposed metal of the wired top pin. USE CAUTION

WHEN PROBING SO NO SHORT OCCURS TO OTHER METAL.

A) If battery voltage is 0 VDC or less, the connecting wires may be open or a battery may be turned the wrong way.

B) If battery voltage is 12-13 VDC, batteries should be charged prior to battery operation.

17. Install Battery fuse (4 amp) in rear panel.

18. Check Battery Charging Circuit.

A) Visually check fuse (1/2 amp) on top power supply board.

B) With unit plugged in and in STBY, turn charging switch on. An increase in battery voltage should be noted.

C) Voltage at charging circuit fuse should reach approximately 14.6 VDC at the end of a complete overnight charge.

19. Reinstall cover and four (4) hold down screws.