PRE-AMPLIFIER
MODEL PAL-010

100 Hz - 30 MHz

WARRANTY

All equipment manufactured by **Com-Power Corporation** is warranted against defects in material and workmanship for a period of three years from the date of shipment. Com-Power Corporation will repair or replace any defective item or material if notified within the warranty period.

You will not be charged for warranty service performed at our factory. You must, however, prepay inbound shipping costs and have a return authorization.

This warranty does not apply to:

a) products damaged during shipment from your plant or ours.
b) products improperly installed.
c) products outside their specifications.
d) improperly maintained products.
e) consumable items such as batteries, lamps, fuses, etc.
f) modified products.
g) normal wear of material.
h) calibration.

Any warranties or guarantees, whether expressed or implied, that are not specified set forth herein, will not be considered applicable to any equipment sold or otherwise furnished by Com-Power Corporation. Under no circumstances does Com-Power Corporation recognize or assume any liability for any loss, damage or expense arising either directly or indirectly from the use or handling of products manufactured by Com-Power Corporation, or any inability to use them separately or in combination with other equipment or material.

The warranty is void if items are shipped outside the United States, without prior knowledge of Com-Power Corporation.

Warranty Limitations

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the buyer, unauthorized modification or misuse, operation exceeding specifications, or improper site preparation.

SAFETY PRECAUTIONS

This instruction manual contains important information and warnings which have to be followed by the user to ensure safe operation and to retain the equipment in a safe condition. The case, chassis and all measuring terminals are connected to the protective earth contact of the appliance inlet. The instrument is designed to operate with three-conductor power cord with protective ground conductor and a plug with ground contact. The mains/line plug shall only be inserted in a socket outlet provided with a protective ground contact. The protective action must not be negated by the use of an extension cord without a protective conductor. The mains/line plug should be inserted before connections are made to measuring circuits.

Whenever it is likely that protection has been impaired, the instrument shall be made inoperative and be secured against any unintended operation. The protection is likely to be impaired if, for example, the instrument:

-shows visible damage,
-fails to perform the intended measurements,
-has been subjected to prolonged storage under unfavorable conditions (e.g. in the open or in moist environments),
-has been subject to severe transport stress (e.g. in poor packaging).

Maintenance and Service:

There are no user serviceable parts inside the unit. Do not remove the instrument cover. Refer servicing to an authorized Com-Power service center.

About this Manual

This manual provides instructions for using the Preamplifier Model PAL-010.

If You Need Assistance: **If you encounter problems while using the model PAL-010 Preamplifier, contact Com-Power Corporation at (714) 52-9800**

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General Information

1

This section includes the following:

* Introduction
* General Description
* Specifications
* Equipment Supplied

1.1 Introduction

The Com-Power model PAL-010 preamplifier is a general purpose, high gain, broadband amplifier. It amplifies signals in the 100 Hz to 30 MHz frequency range. It features low noise, low distortion, flat frequency response, and high gain along with long term stability and reliability.

1.2 General Description

The PAL-010 Preamplifier is specifically designed as a high gain Preamplifier for emission measurement for Electromagnetic Compatibility (EMC). It is ideally suited to provide input isolation to your expensive test equipment while enhancing the sensitivity and reducing the noise level. It can be used for an Open Area Test Site (OATS) or in a semi-anechoic chamber. It can also be used for other applications as a general purpose preamplifier to improve the sensitivity of any test system.

1.3 Equipment Specifications

The functional specifications and environmental characteristics of the Model PAL-010 are listed in Table 1-1.

Table 1-1. Equipment Specifications

Frequency Range:	100 Hz - 30 MHz
Gain (dB):	28 dB ± 2 dB (Typical)
Input / Output Impedance:	50 Ohm
Max. DC Input:	10 VDC
Rechargeable Batteries:	Two 6V NimH battery packs
Max. Input Power:	0 dBm, CW
Connector Type:	BNC (female)

General

Operating temperature: 10° to 50°C
Power voltage: 15 VDC, 500 mA
Weight: 1.5 kg (3.3 lbs.) max.
Dimensions: 75mm (3.0")H x 125mm (5.0")W x 188mm (7.5")D
Maximum operating altitude: up to 2200m .
Maximum relative humidity: up to 80%.

Operating Conditions:

The instrument is designed for indoor use. The permissible ambient temperature during operation is +10° to 50°C. The permissible ambient temperature range for storage or transportation is -40° to 70°C. The maximum relative humidity is 80%. However, water condensation in the instrument should not be allowed. The instrument should be kept in a clean and dry room and must not be operated in explosive, corrosive, dusty, or moist environments.

1.4 Equipment, Accessories, and Documents Supplied

Immediately after unpacking, the instrument should be checked for visual signs of damage. If there is transport damage, the supplier must be informed immediately. The instrument must then not be put into operation.

Equipment, accessories, and documents supplied with Model PAL-010 Preamplifier are:

a) Calibration Data & Certificate.
b) User's Guide.
c) DC adapter.

1.5 Maintenance

The recommended calibration period for the Preamplifier is 12 months. However, its performance should be checked periodically. Only in this way is it largely certain that all signals are amplified with accuracy.

The exterior of the instrument should be cleaned regularly with a dusting brush. Dirt which is difficult to remove on the casing and aluminum parts, can be removed with a moistened cloth (99% water +1 % mild detergent). Spirit or washing benzene (petroleum ether) can be used to remove greasy dirt. Under no circumstances may the cleaning fluid get into the instrument. The use of other cleaning agents can attack the plastic and paint surfaces.

Fuse type

Size 5 x 20 mm; 250 Volt AC, 0.5 A fuse; Time characteristic: time-lag.

Figure 1.1 Model PAL-010 Preamplifier

Operating Controls and 2

This section includes the following:

* Introduction
* Controls and Indicators
* Operation

2.0 Introduction

This Section identifies the location of the Preamplifier controls and indicators; it also describes the operation.

It is very important to read "Safety" instructions prior to operating the PAL-010.

The simple front panel layout allows efficient operation right from switch on. However, to ensure the optimum operation of the instrument, some basic instructions need to be followed.

The input section of the preamplifier is sensitive. The voltage at the input must not exceed the values noted on front panel of the preamplifier. If these values are exceeded the input stage might be damaged.

Prior to examining unidentified signals, the presence of unacceptable high input voltages has to be checked. This can be done by (a) measuring without the preamplifier (b) measuring with an input attenuation on the preamplifier. By using these precautions, the user can virtually eliminate the possibility of excessively high signal amplitudes at the input.

2.1 Controls and Indicators

The function of these controls and indicators is described here.

2.1.1 POWER SWITCH

The power switch has ON and OFF symbols. If power switch is turned to ON position, the integrated LED will be lit.

2.1.2 BATTERY LOW INDICATOR

This LED indicator will turn on when the battery needs to be recharged. The preamplifier can operate up to 12 hours with battery power, when the battery is charged to full capacity. The recharging time is typically 8 hours when the battery low indicator turn on.

2.1.3 POWER SOCKET

The power to preamplifier is supplied by a 15 VDC adapter supplied with the unit. The 2.1 x 5.5 mm socket on the back panel is used to connect the adapter to the preamplifier during normal use. The

2.1.4 INPUT/OUTPUT CONNECTORS

The signal input and output connectors are 50 ohm type BNC female connectors. The mating connectors and cables must be matching impedance.

2.1.5 POWER LINE FUSE

The fuse is located on the back panel next to the power line input connector. The power line fuse is rated 0.5 A, 250 VAC.

2.1.6 BATTERY COVER

The battery cover is located on the bottom of the unit. It can be removed to access the battery pack if it requires changing.

2.2 Operation

The Pre-amplifier Model PAL-010 just plugs in between the antenna or any signal source and the receiver (or any measuring equipment). It is easy to use. However, one must be careful not to inject very large signal in to its input, because (a) that can damage its sensitive input stage or (b) give erroneous data by saturating its input.

2.3 Applications

The large gain and broad frequency range make this amplifier the ideal front end to the test equipment used for the FCC, Mil-std and CISPR test requirements. The emission limits for radiated tests for these specifications are stringent and are required to be done at 3 meters or 10 meter distance. A large gain preamplifier is normally recommended to improve test system noise floor.

The PAL-010 is typically used with the magnetic loop antenna or a monopole antennas for emission measurements.

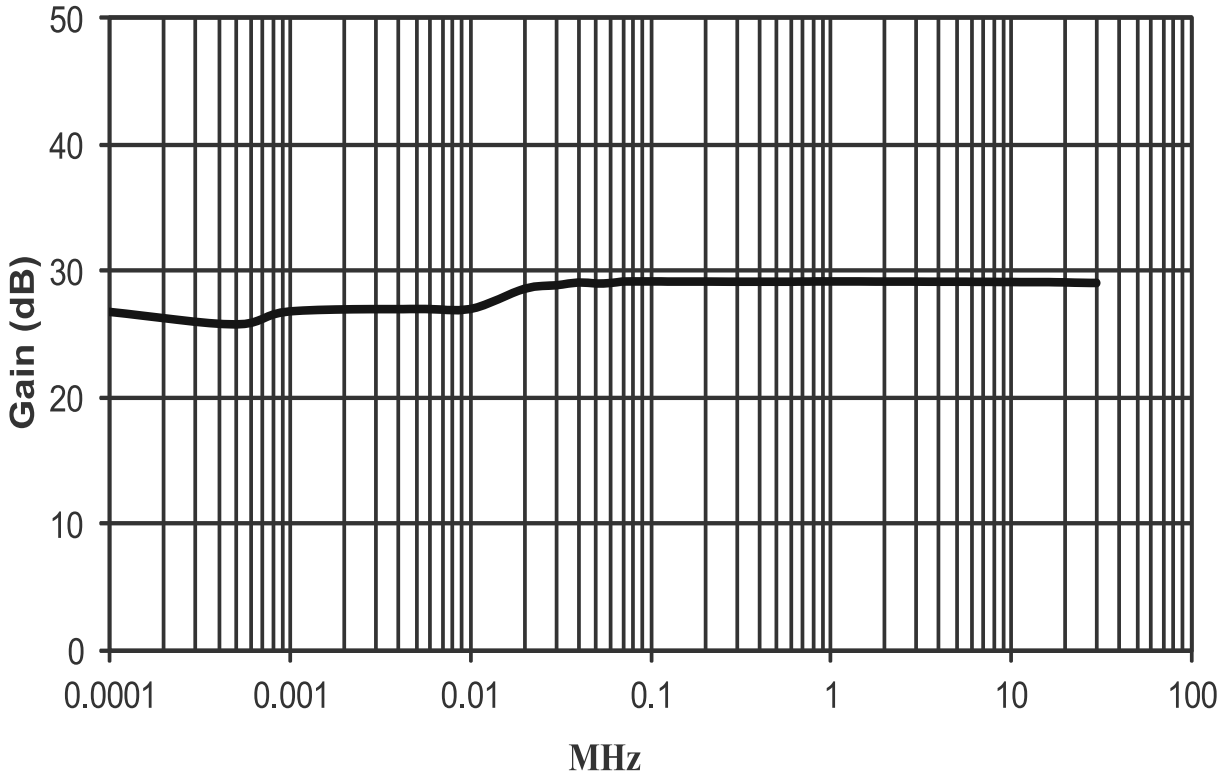

Figure 2.1 Preamplifier Frequency Response

A high gain amplifier makes it easier to detect noise sources. Therefore, this preamplifier Model PAL-010 can also be used with a Near Field Probe set while investigating noise source on printed wiring boards, switching circuits or systems. The PAL-010 is specially helpful for investigating the low amplitude and low frequency H-fields.

Theory of Operation 3

This chapter explains the following:

* Overview
* Theory of Operation

3.0 Overview

This section describes the theory of operation for the Model PAL-010 premaplifier.

3.1 Theory of Operation

The preamplifier is basically cascaded wide band amplifiers in a 50 ohm matched system. The stable gain amplifier is powered by regulated power supply and provides stable and flat gain across the frequency of operation. The high gain is obtained with relatively low noise figure, thus enabling in improved system noise figure.

3.1.1 Sensitivity

Sensitivity is a measure of the ability of the preamplifier to detect small amplitude signals. The maximum sensitivity of an analyzer is limited by its internally generated noise. This noise is basically of two types: thermal (or Johnson) and Non-thermal noise. Thermal noise power can be expressed as:

PN =k xT xB
where: PN = Noise power in watts
k = Boltzmanns Constant (1.38 x 1 0^{-23} Joule/K)
T = absolute temperature, K
B = bandwidth of system in Hertz

As seen from this equation, the noise level is directly proportional to bandwidth. Therefore, a decade decrease in bandwidth results in a 10 dB decrease in noise

level and consequently 10 dB better sensitivity. Non-thermal noise accounts for all noise produced within the analyzer that is not temperature dependent. Examples of non-thermal noise source are non-linear active elements, impedance mismatch, nearby circuits, etc.

The input which will always result in less than 1 dB gain compression is called the linear input level. Above 1 dB gain compression the preamplifier is considered to be operating nonlinear because the signal amplitude is not an accurate measure of the input signal level.

3.1.2 Frequency Response

The frequency response of an amplifier is the amplitude linearity of the amplifier over its frequency range. For accurate amplitude measurements, a system should be as flat as possible over its frequency range. The PAL-010 has stable and flat frequency response from 100 Hz to 30 MHz. The preamplifier, however, can be calibrated across its operating frequency and this data should be used to eliminate the effect of gain variation with frequency.