INSTRUCTION MANUAL

CURRENT PROBE

AMPLIFIER

MODEL PCA-11

20 Hz – 50 kHz

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ELECTRO-METRICS

MODEL PCA-11

20 Hz-50 kHz

SERIAL NO: N/A

ELECTRO-METRICS CORPORATION

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WARRANTY

This Model PCA-11 Current Probe Amplifier is warranted for a period of 12 months (USA only) from date of shipment against defective materials and workmanship. This warranty is limited to the repair of or replacement of defective parts and is void if unauthorized repair or modification is attempted. Repairs for damage due to misuse or abnormal operating conditions will be performed at the factory and will be billed at our commercial hourly rates. Our estimate will be provided before the work is started.

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DESCRIPTION AND USE ELECTRO-METRICS MODEL PCA-11 CURRENT PROBE AMPLIFIER

1.0 Description

The PCA-11 Current Probe Amplifier is used in conjunction with the PCL-11 Current Probe for measuring current flow through a conductor. This current is indicated directly on the EMC-11 meter; no calculations or conversion factors are necessary. The current is measured without direct connection to the circuit under test simply by clamping the probe around the current carrying conductor. In the case of more than one conductor, the response will be the algebraic sum of the currents.

The PCA-11 design meets the broadband measurement requirements of MIL-STD-826 and MIL-STD-826A and the narrowband measurements of MIL-STD-461/2. The amplifier complements the frequency response of the probe to produce a flat, one-ohm transfer impedance output to the EMC-11 with direct voltage to amperage conversion and minimum loss of sensitivity.

All operating power for the PCA-11 is supplied by the EMC-11.

2.0 Specifications

2.1 Electrical

Frequency Range:	20 Hz-50 kHz.
Input Impedance:	50Ω.
Output Impedance:	600Ω.
Input Connector:	BNC, female.
Output:	Coaxial Cable-TWINAX PLUG.

2.2 Mechanical

Length:	159 mm (6.25").
Width:	84 mm (3.3").
Height:	38 mm (1.5").
Weight:	454 g (1 lbs).

3.0 Theory Of Operation

The PCL-11 is an instrument type transformer that utilizes the conductor under test as a single turn primary. This is accomplished by clamping the probe or secondary winding around the conductor that induces a current in the probe. The current is amplified by the PCA-11 and transformed into a meaningful representation on the EMC-11 digital meter. The amplifier in the PCA-11 terminates the PCL-11 Current Probe with 50 ohms and feeds a 600 ohm load. The effects of stray fields are minimized by the electrostatically shielded cases of the probe and amplifier.

The PCA-11 complements the low frequency response of the PCL-11 to produce a unity transfer impedance. This allows direct conversion from voltage to current on the EMC-11 digital meter according to the following definition of transfer impedance.

The transfer impedance of the PCA-11/PCL-11 system is defined as:

$$Z_t = E_o/I_1$$

Where:

E_o = Voltage at input terminals of the EMC-11.
I_1 = Current in the conductor.

If the constant transfer impedance is one ohm and the voltage is known, the formula may be transposed to $I_1 = E_o/1$ ohm. Therefore, I_1 may be assumed to be numerically equal to E_o (absolute value of I_1 is equal to the absolute value of E_o).

4.0 Operating Instructions

4.1 Power Requirements

All operating power is supplied by the EMC-11.

4.2 Operation

Before making any measurement with the PCL-11 and PCA-11 the operator should become completely familiar with Section II (Operating Instructions) of the EMC-11 manual.

a. Calibrate the EMC-11 (refer to Paragraph 2.3 in the EMC-11 Instruction Manual).

b. To measure the current in a conductor, the PCL-11 Probe is fastened around the conductor of interest. The Output Cable from the PCA-11 is connected to the EMC-11 Input Connector and the Power Cable connected to the EMC-11 Probe Connector.

c. The value of current is read directly from the EMC-11 digital meter in dB(µA), since the absolute value of 1 Volt is equal to the absolute value of 1 A by the one ohm transfer impedance of the setup. Measurements may be made in any bandwidth.

CAUTION

If currents in excess of 110 dB(µA)(approximately 300 mA) are encountered, a 50-ohm attenuator should be inserted between the PCL-11 and the PCA-11. A 40 dB BNC attenuator is provided for this purpose. A 40 dB correction factor must be added to the EMC- 11 reading in this case.

5.0 Service And Maintenance

This section provides the information for the calibration, maintenance, and repair of the PCA-11.

5.1 Instrument Access

To gain access to the PCA-11, remove the 14 screws on the sides and top of the housing.

5.2 Calibration

This test may be conducted each time as part of the periodic maintenance procedure.

a. Calibrate the EMC-11 (refer to Paragraph 2.3 in the EMC-11 Instruction Manual).

b. Set the front panel controls of the EMC-11 as follows:

FREQUENCY DISPLAY Indication.....10.00 kHz
LOW PASS FILTER.....50 kHz
HIGH PASS FILTER.....16 Hz
IMPEDANCE.....110 dB
TUNING MODE.....MANUAL
BANDWIDTH.....100 Hz
DETECTOR.....RMS
OUTPUT FUNCTION.....TRACK

c. On the EMC-11, connect the tracking signal available at the front panel Output Connector (BNC) to the RF Input Connector (TWINAX) by means of a TBA-11 adapter cable and a BNC coaxial cable (e.g., CAC-11).

d. Adjust front panel EMC-11 LEVEL CONTROL for an indication of 120 dB(µV) on the Digital Meter. This sets the reference for the following procedure.

e. Remove the cable from the EMC-11 and connect a one turn loop of cable terminated in 600 ohms to the Output Connector.

The test loop can be made from a coaxial cable with one end secured to a BNC connector and the other end to a 600-ohm, 1% noninductive resistor mounted on a terminal board, by stripping back the outer insulation and braid conductor approximately 16" leaving just enough braid exposed to solder the bus wire to the braid. The bus wire and inside conductor are soldered to the terminals of the boards.

f. Clamp the PCL-11 Probe around the cable loop and connect the PCL-11 to the Input Connector on the PCA-11 with a BNC coaxial cable, CAC-11 or equivalent.

g. The TWINAX Cable (J1) on the PCA-11 should be connected to the RF Input Connector of the EMC-11.

h. Connect and lock the Power Connector to the EMC-11 Probe Connector by pushing the locking bar all the way toward the digital meter side of the EMC-11 after the connector is engage.

i. Set the EMC-11 ATTENUATOR for 60 dB.

j. The EMC-11 digital meter should now read 64 dB(μV)(1 V/600 ohms), which can be converted directly to a current of 64 dB(μA), $I1 = E_o/Z_t$.

k. If the EMC-11 does not read 64 dB(μV), refer to Section 4.4.

5.3. PCA-11/PCL-11 Calibation

NOTE: Instruments that are shipped together have been calibrated as a set at the factory, therefore, it is recommended that the following calibration be performed only if absolutely necessary.

a. Remove the cover to gain access to the subassembly.

b. With the test circuit connected, as in 4.3 Steps e thru h, adjust the gain of the PCA-11 (screw driver adjustment on the P.C. board) until a reading of 64 dB(μV) is obtained on the EMC-11 Digital Meter. The PCA-11 and PCL-11 now have been calibrated to the specified one ohm transfer impedance.

5.4 Troubleshooting

a. Faulty operation may be caused by improper operating voltages from the EMC-11 or damaged cables.

b. Damaged cables and/or connectors may be isolated by making continuity measurements.