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TRAMP
TRANS-IMPEDANCE AMPLIFIER

P/N 79-10-038
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CONTENTS

		Page
1.0	GENERAL INFORMATION	
1.1	Introduction	1
1.2	Features	1
1.3	Applications	1
1.4	Cautions	1
2.0	PREPARATION FOR USE	
2.1	Inspection	2
2.2	Instrument Identification	2
2.3	Input Power Requirements	2
2.4	Turn-On and Checkout Procedures	2
2.5	Repacking for Shipment	3
3.0	OPERATION	
3.1	Instrument Controls	3
3.2	Instrument Connectors	4
4.0	Maintenance	4

APPENDICES A - Computer Interface Connector
B - Specifications

1.0 GENERAL INFORMATION

1.1 Introduction

The TRAMP® is a low noise, high gain, trans-impedance amplifier used primarily to interface non-biased silicon photodiodes to a variety of measurement devices (i.e.: data acquisition systems, oscilloscopes, DMMs).

1.2 Features

The TRAMP® features:

- very low noise
- eight decades of gain ranging between 10^3 and 10^{10} (Ohms)
- remote computer control using data acquisition interface (digital input/output, analog output)
- integral NiCad battery pack with normal and trickle charge modes
- line powered operation using transformer supplied
- output scaling to interface to chart recorders and other equipment
- optimal measurement range indicator

1.3 Applications

The TRAMP® has been specifically design as a low cost, lab quality instrument to interface silicon photodiodes to a variety of measurement equipment. Some of the applications the TRAMP® was designed to satisfy are:

- laboratory research
- OEM manufacturers
- automatic test equipment
- educational
- detector interface (any type of photo current producing detector in the photovoltaic mode (i.e.: silicon, germanium, GaAsP, InGaAs, etc.)

1.4 Cautions

Use only the battery charger transformer supplied with unit. Failure to do so may cause permanent damage to the TRAMP® and may result in personal injury. To avoid electrical shock, use proper care when using the battery charger transformer. Do not leave the battery charger transformer plugged into wall outlet if unit is turned off and batteries do not need charging. This will cause damage to the batteries.

2.0 PREPARATION FOR USE

2.1 Inspection

The TRAMP® shipping carton should contain the following items:

- TRAMP® trans-impedance amplifier
- AC line battery charger transformer
- Instruction manual
- Product Warranty & Return Procedures

The instrument was inspected prior to shipment and found to be free of mechanical and electrical defects. Immediately after unpacking the instrument, inspect for damage that may have occurred during transit. If any damage is found, a claim should be filed with the carrier and Graseby Optronics should be contacted for a Return Materials Authorization (RMA) number.

2.2 Instrument Identification

The model and serial number of the instrument are located on the tag attached to the back of the unit. The serial number of the instrument, as well as a copy of the test performance results, are kept on file at Graseby Optronics to correlate with the manufacturing and quality assurance records.

2.3 Input Power Requirements

The TRAMP® receives its primary power from the battery charger transformer. The transformer has been configured to supply the proper power to the TRAMP® while adapting to the various worldwide voltages and plug configurations.

2.4 Turn-on and Checkout Procedures

2.4.1 Connect the transformer to the TRAMP®.

2.4.2 Connect the transformer to the AC power source.

2.4.3 Turn on power by depressing the POWER switch and verify that the LED under the gain level 10^3 is lit. If this does not occur, verify power connections are made properly and check that the power is on.

NOTE: If the LO BATT indicator is on, verify the batteries are thoroughly charged prior to using the TRAMP® in the battery powered configuration.

The TRAMP® is now ready for use.

2.5 Repacking for Shipment

To prevent damage, it is recommended that the package designed for the instrument be used when shipping. The original packaging is intended to be used for shipping, carrying and as a storage case.

3.0 OPERATION

3.1 Instrument Controls

3.1.1 Front Panel

3.1.1.1 POWER: Depress switch to turn the TRAMP® on or off. With the switch off and the battery charger transformer connected to the TRAMP®, the battery charger is in normal charge mode and will fully charge the batteries in approximately 14 hours. With the switch on, the "trickle" charge mode provides nominal charging current. Warning: Do not overcharge battery, see Section 1.4.

3.1.1.2 GAIN SELECT ◄►: Allows selection between the eight gain levels. Note the gain levels are in V/A (ohms) ranging from 10^3 to 10^{10} V/A.

3.1.1.3 ZERO: Used to null the offset of the TRAMP®. With no input signal applied, adjust output for 0 Vdc. Based upon individual operating conditions, this adjustment should be done as needed.

3.1.1.4 Gain Level LEDs: The LEDs indicate the selected gain level.

3.1.1.5 OVLD: Signals an input overload condition and indicates the TRAMP® is not in the proper gain range to optimally amplify the input signal. When this condition exists, select the next lowest gain level. Continue this procedure until the LED is no longer lit.

3.1.1.6 LO BATT: Indicates the batteries require charging. Under this condition, the internal power of the TRAMP® is too low to accurately amplify the input signal and as such, the output signal accuracy should be suspect.

3.1.2 Rear Panel

3.1.2.1 SCALE ADJ: The potentiometer adjusts the full scale analog output voltage of the TRAMP®. It can be adjusted to suit the user's requirements, but will normally be set fully clockwise. Absolute gain selection is accurate only when this control is fully clockwise.

3.2 Instrument Connectors

INPUT: Female, BNC-type on front panel.

OUTPUT: Female, BNC-type on rear panel. The guaranteed output range is between ±5 volts; however the unit will produce approximately ±6.5 volts. Although the instrument is capable of producing the higher voltage, it should be noted that the OVLD indicator will be active when the output exceeds the guaranteed range. Indicating a new gain selection is required for optimal operation.

COMPUTER INTERFACE (P3): Provides the signal lines necessary to control the TRAMP® remotely. See Appendix A.

CHARGER: Accepts charger input from transformer. Plug the transformer output into the charger input connector prior to connecting to AC power source.

4.0 MAINTENANCE

This unit requires no user maintenance procedures. If the unit is in need of repair, follow the instructions in the Product Warranty and Return Procedures enclosed with the unit.

APPENDIX A

COMPUTER INTERFACE CONNECTOR

COMPUTER INTERFACE CONNECTOR

The connector should be configured as follows:

PIN	SIGNAL	DESCRIPTION
1	COMMON	Analog Ground.
2	ZERO	Active low CMOS compatible input. This signal forces the analog output to 0 Vdc (±5 mVdc). It can be used to provide a zero volt reference signal to the data acquisition system.
3	+5 Vdc	Along with the COMMON signal, this signal can be used to "hardwire" a specific gain level using the previously described gain selections. **WARNING:** This power source is available to drive the gain selection inputs of the TRAMP® only. Do not use this power source for any other purpose. Permanent damage to the TRAMP® can be expected.
4	OVERLOAD	Active low CMOS compatible output. Indicates the gain range selected is not optimal.
5	LOW BATTERY	Active low CMOS compatible output. Indicates that the batteries require charging. Measurements taken while this indicator is active should be suspect.
6 7 8	Gain Select A (LSB) Gain Select B Gain Select C	Active high CMOS compatible inputs. To select gain ranges, use the following standard binary sequence:

A	B	C	Range
0	0	0	10^3
1	0	0	10^4
0	1	0	10^5
1	1	0	10^6
0	0	1	10^7
1	0	1	10^8
0	1	1	10^9
1	1	1	10^{10}

Unit must first be manually placed on the 10^3 gain selection before using the computer interface. The user must place

		CMOS high level inputs (≥3.5 Vdc) on these lines to insure proper operation.
9	OUTPUT	This is the same analog signal output to the rear panel BNC-connector. It is included here to give the user maximum flexibility when connecting to a data acquisition system. In the event the user plans to make very low voltage measurements, a coaxial cable connected between pins 9 and 1 of the computer interface connector is suggested.

APPENDIX B

TRAMP SPECIFICATIONS

TRAMP Specifications

Gain (volt/ampere)	10^3 - 10^{10}
Noise (mV RMS)	0.5
Current Range (amps)	10^{-2} - 10^{-13}
Overall accuracy	±2%
Bandwidth vs. Gain	10^3 @ 160 kHz
	10^4 @ 45 kHz
	10^5 @ 12 kHz
	10^6 @ 12 Hz
	10^7 @ 550 Hz
	10^8 @ 550 Hz
	10^9 @ 5 Hz
	10^{10} @ 5 Hz
Offset drift vs. temp	less than 50 μV/°C
Input impedance	0.001 ohms typical
Output impedance	less than 1 ohm
Output voltage	±5V
Power supply	115/230 VAC
Battery life	15 hours
Type	10 AA NiCad
Physical dimensions	2.76H x 5.91W x 7.51L inches

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