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**User Manual**

**Model TE3180**

**PXIbus  
SINGLE CHANNEL  
HIGH VOLTAGE AMPLIFIER  
Publication No. 121024**

***Tabor Electronics Ltd.***

**Tabor Electronics Ltd.**  
P.O. Box 404, Nesher Israel 20302  
Tel: +972-4-821-3393, FAX: +972-4-821-3388

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# FOR YOUR SAFETY

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Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



**CAUTION**  
RISK OF ELECTRICAL SHOCK  
DO NOT OPEN



This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.



If this instrument is to be powered from the AC line (mains) through an auto-transformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.



Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.



Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.
2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until, performance is checked by qualified personnel.

# DECLARATION OF CONFORMITY

We: Tabor Electronics Ltd.  
9 Hatasia Street, Tel Hanan  
ISRAEL 36888

declare, that the 180Vp-p Signal Amplifier

## Model TE3180

meet the intent of Directive 89/336/EEC for Electromagnetic Compatibility and the requirements of the Low Voltage Directive 73/23/EEC amended by 93/68/EEC. Compliance was demonstrated to the following specifications as listed in the official Journal of the European Communities:

**Safety:**

IEC/EN 61010-1 2<sup>nd</sup> Edition:2001+ C1, C2

**EMC:**

EN 50081-1 Emissions:

EN 55022 - Radiated, Class B

EN 55022 - Conducted, Class B

EN 50082-1 Immunity:

IEC 801-2 (1991) - Electrostatic Discharge

IEC 801-3 / ENV50140 (1993) - RF Radiated

IEC 801-4 (1991) - Fast Transients

The tests were performed on a typical configuration.

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# Chapter 1

## PORTRAYAL

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### What's In This Chapter

This chapter contains general and functional description of the Model TE3180 wideband amplifier. It also describes the front panel connectors and operational modes and provides description of all features available with the instrument.

### Introduction

The Model TE3180, as shown in Figure 1-1, is a 3U single-slot, PXI-based high voltage power amplifier. The amplifier is used for signal amplification purposes. Offering unprecedented signal purity, the model TE3180 amplifies signals from dc to over 1 MHz. The unit has a fixed gain of x20 however; one may order the same amplifier with custom gain without jeopardizing signal purity and amplifier performance.

Common problem with PXI equipment is the inability to produce high voltages, which results from low power supply rails. For example, waveform generators, or similar signal source devices, draw power from the  $\pm 12$  V rails. Consequently, they cannot produce signals above 16 Vp-p because of rail-to-rail amplitude limitation. The model TE3180 solves this problem by using two dc/dc converters to increase rail voltage to +190 V and -190 V. In turn, the increase of rail voltage plus custom components and unique design permits amplification of input signals to 180 Vp-p. The power amplifier draws current mainly from the  $\pm 12$  V rails and some from the +5 V rail, leaving the other power supply rails free to supply their full current rating to other devices.

The wideband amplifier occupies just one PXI slot however, its performance is unique and outstanding by any standards. At over 300 kHz bandwidth and with full amplitude swing one can use the Model TE3180 in any demanding application.



## Conventions Used in this Manual

The following conventions may appear in this manual:



*A Note contains information relating to the use of this product*



*A Caution contains information that should be followed to avoid personal damage to the instrument or the equipment connected to it.*



*A Warning alerts you to a potential hazard. Failure to adhere to the statement in a WARNING message could result in personal injury.*

The following symbol may appear on the product:



This refers you to additional information contained in this manual. The corresponding information in the manual is similarly denoted.

## TE3180 Series Feature Highlights

- Single-width PXI card
- Large signal bandwidth to 300 kHz
- Small signal bandwidth to 1 MHz
- High amplitude to 180 Vp-p
- Low distortion
- Custom Configuration of gain

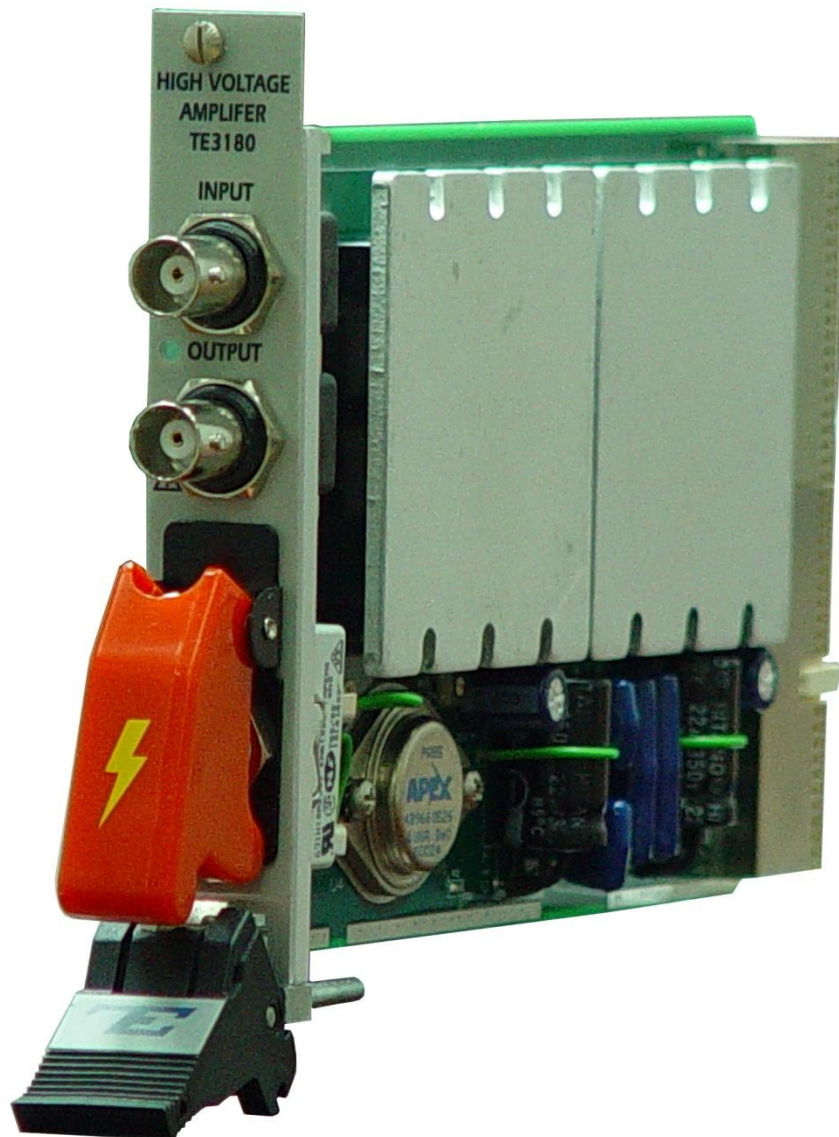


Figure 1-1, TE3180

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## Functional Description

Detailed functional description of the features, operation and options available with the TE3180 is given in the following paragraphs. The wideband amplifiers can be ordered with different gain configurations. therefore read the following description carefully and make sure your amplifier is configured correctly for your application before you install and use this card.

## Options

Model TE3180 must be ordered from the factory already configured for your application. There will be no schematics, nor instructions how to modify the amplifier for other configurations as any configuration change may affect the amplifier performance.

Below, you'll find a list of optional gain configurations for the high voltage amplifier:

**Gain** – specifies gain magnitude of the input signal. Factory default setting is 20 however, any custom gain from 10 to 50 can be specified. Note that some characteristics of the output section may change for gain setting above 20.

As explained above, gain option must be specified at the time of your purchase and the TE3180 is supplied fully configured. Reconfiguration of fielded cards can only be done by qualified personnel.

## Specifications

Instrument specifications are listed in Appendix A. These specifications are the performance standards or limits against which the instrument is tested. Specifications apply under the following conditions: output terminated into matching impedance, after at least 15 minutes of warm up time, and within a temperature range of 20°C to 30°C. Specifications outside this range are degraded by 0.1% per °C.

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## Front Panel Connectors

There are a few controls and indicators on the front panel. These control and indicate the status of the high voltage output. These controls are described in the following. Refer to Figure 1-1 throughout the description.

## High Voltage Switch and Indicator

The high voltage switch, latch and indicator are part of the safety measures taken to avoid exposure to lethal voltage hazards. Note the position of the latch. When in the down position, the high voltage path to the output amplifiers is disconnected and no hazardous voltages are present at the output terminals. One can turn on the power to the output terminals only by lifting the safety latch and switching the high voltage on with the HI-V switch. High voltage on is indicated by a clear light at the center of the front panel. Use extreme caution when the high voltage light is on to avoid contact with the inner conductor of the BNC connector.

In case of emergency, hit the latch from the top. The mechanical construction of the latch is specially made to flip the high voltage switch to the off position and hence remove the high voltage from the output terminals.

## Input

The input connector accepts signals within the range of DC to over 1 MHz and amplifies them by a fixed gain. If you did not specify an optional gain value, the TE3180 is supplied with a fixed gain of 20.

Unless otherwise requested, the input signal of the TE3180 is terminated by a 50  $\Omega$  resistor and hence the amplifier input cannot tolerate high voltages on its input connector. Therefore, before applying the cable to the input connector, make sure that your signal level does not exceed input rating, as specified in Appendix A of this manual.

## Output

Amplified signals are generated from the output connector. Output source impedance is 0.1 $\Omega$ . Each output connector can generate signals from -90 V to +90 V with continuous currents up to 50 mA.

Normal loads are expected to be of resistive nature however, with some degradation of its bandwidth, the output can drive capacitive loads up to 1 nF, while still maintaining its full amplitude range.



### **WARNING**

**Applying the output signal on highly inductive or highly capacitive loads may damage the amplifier.**

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## Grounding Considerations

Understanding how to connect your ground path could be critical to preserving the integrity of your output signal. If you are using a single-ended output then it will probably be safe for you to connect the circuit ground to case ground.



### **WARNING**

**Input and output grounds are tied together and therefore, it is absolutely forbidden to connect the output ground to a different level than the input ground. Failure to adhere to this limitation may damage the TE3180 and the surrounding equipment connected to its I/O connectors.**

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## Operating Instructions

Being a passive device, there are no controls, nor computer programming required to operate the Model TE3180. The following procedure is recommended for proper operation of the power amplifier:

1. Make sure your card is configured for input and output impedance, gain and grounding
2. Follow the installation instructions given in Chapter 2 of this manual
3. Connect the output terminal to your load
4. Connect the input terminal to your source
5. Turn on power to your PXI system



**WARNING**

**There is no switch control to power the Model TE3180 on and off and therefore, the amplifier is active immediately after you power up your PXI chassis. Always make sure your load is protected from inadvertent power up conditions before you turn on your PXI chassis.**

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# Chapter 2

## INSTALLATION

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### Installation Overview

This chapter contains information and instructions necessary to prepare the Model TE3180 for operation. Details are provided for initial inspection, grounding requirements, repackaging instructions for storage or shipment and installation information.

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### Unpacking and Initial Inspection

Unpacking and handling of the generator requires normal precautions and procedures applicable to handling of sensitive electronic equipment. The contents of all shipping containers should be checked for included accessories and certified against the packing slip to determine that the shipment is complete.

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### Safety Precautions

The following safety precautions should be observed before using this product and associated computer. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified persons who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. The following sections contain information and cautions that must be observed to keep the TE3180 operating in a correct and safe condition.



#### CAUTION

**For maximum safety, do not touch the product, test cables, or any other instrument parts while power is applied to the circuit under test. ALWAYS remove power from the entire test system before connecting cables or jumpers, installing or removing cards from the chassis. Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always keep your hands dry while handling the instrument.**

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## Operating Environment

The TE3180 is intended for operation within a PXI chassis as a plug-in module. Ensure the PXI chassis being used to host the TE3180 fully conforms to the latest PXI specifications.

The TE3180 is intended for indoor use and should be operated in a clean, dry environment with an ambient temperature within the range of 0 °C to 40 °C.



### **WARNING**

**The TE3180 must not be operated in explosive, dusty, or wet atmospheres. Avoid installation of the module close to strong magnetic fields.**

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The design of the TE3180 has been verified to conform to EN 61010-1 safety standard per the following limits: Installation (Overvoltage) Category I (Measuring terminals) Pollution Degree 2

Installation (Overvoltage) Category I refers to signal level, which is applicable for equipment measuring terminals that are connected to source circuits in which measures are taken to limit transient voltages to an appropriately low level.

Pollution Degree 2 refers to an operating environment where normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.

## Power Requirements

The TE3180 operates from within a PXI chassis. DC Voltages are supplied to the instrument from the PXI backplane. The instrument requires a variety of DC voltages as outlined in the Specifications section (Appendix A). Ensure the PXI chassis is capable of delivering required voltages and has sufficient current to drive the amplifier.



### **CAUTION**

**Disconnect power to the PXI Chassis before installing or removing the TE3180.**

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## Grounding Requirements

To conform to the applicable safety and EMC requirements, ensure that the TE3180 instrument panel and the PXI chassis are “earth” grounded.



### **CAUTION**

The outer shells of the front panel terminals (Input, Output) can float from case ground. Refer to Figure 2-1 and the instructions in this manual to disconnect/connect the circuit ground from/to case ground.

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## Floating the Input/Output Grounds



### **WARNING**

Input and output grounds are tied together and therefore, it is absolutely forbidden to connect the output ground to a different level than the input ground. Failure to adhere to this limitation may damage the TE3180 and the surrounding equipment connected to its I/O connectors.

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## Calibration

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The recommended calibration interval is three years. Calibration should be performed by qualified personnel only.

## Abnormal Conditions

Operate the TE3180 only as intended by the manufacturer. If you suspect the TE3180 has been impaired, remove it from the PXI Chassis and secure against any unintended operation. The TE3180 protection is likely to be impaired if, for example, the instrument fails to perform the intended operation or shows visible damage.



### **WARNING**

Any use of the TE3180 in a manner not specified by the manufacturer may impair the protection provided by the instrument

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## Long Term Storage or Repackaging For Shipment

If the instrument is to be stored for a long period of time or shipped immediately, proceed as directed below. If you have any questions, contact your local Tabor representative or the Tabor Customer Service Department.

1. Repack the instrument using the wrappings, packing material and accessories originally shipped with the unit. If the original container is not available, purchase replacement materials.
2. Be sure the carton is well sealed with strong tape or metal straps.
3. Mark the carton with the model and serial number. If it is to be shipped, show sending and return address on two sides of the box.



### NOTE

**If the instrument is to be shipped to Tabor for calibration or repair, attach a tag to the instrument identifying the owner. Note the problem, symptoms, and service or repair desired. Record the model and serial number of the instrument. Show the returned authorization order number (RMA) as well as the date and method of shipment. ALWAYS OBTAIN A RETURN AUTHORIZATION NUMBER FROM THE FACTORY BEFORE SHIPPING THE INSTRUMENT TO TABOR.**

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## Preparation for Use

Preparation for use includes removing the instrument from the bag and installing the TE3180 inside the PXI chassis.

## Removing the Instrument from the Bag

The TE3180 is supplied in an antistatic bag. Check the seal on the bag to make sure the bag was not opened in a static-unsafe environment. Place the enveloped card on static free surface and hook yourself up with a grounding strap. Only then break the seal and remove the card from the envelope. Hold the card at the metal panel end. Refrain from touching the instrument with your finger at all times.

## Installation

Plug the TE3180 into your PXI chassis and lift the extractor to the upright position. Push the card firmly until the metal panel makes contact with the metal edge of the PXI chassis. Using a suitable screwdriver, tighten the two retaining screws, top and bottom.



**CAUTION**

Disconnect power to the PXI Chassis before installing or removing the TE3180. An attempt to insert or remove the instrument while the power is connected to the chassis will result in severe damage to the instrument and will automatically revoke your warranty.

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**CAUTION**

Once the TE3180 is installed in the chassis cover all remaining open slots to ensure proper airflow. Using the TE3180 without proper airflow will result in damage to the instrument.

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## SPECIFICATIONS

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### Input Characteristics

Connector	BNC
Impedance	50 $\Omega$ , DC coupled
Damage Level	50 Vp-p

### Output Characteristics

#### General

Connector	BNC
Impedance	0.1 $\Omega$ , DC coupled
Protection	Short-circuit, 10 seconds
Gain	x10, x15, x20, x25, x50 (* Factory configured)
Polarity	Normal, non-inverting
Amplitude	180 Vpp
Output Current	150 mA Max

#### Square Wave Characteristics

Transition Time	<1.5 $\mu$ s
Aberrations	<15%

#### Sine Wave Characteristics

Small Signal Bandwidth	1 MHz, 20 Vp-p (-3dB)
Large Signal Bandwidth	300 kHz, 180 Vpp (-3dB)
Accuracy at Square wave at 1KHz	$\pm$ (2% of full-scale amplitude range + 25 mV)
THD	<0.1%, 10 Hz to 10 kHz; <1.2%, 10 kHz to 200 kHz

#### General

Physical Size	Single-slot, 3U high PXI module
Power Requirements	+12 V, 400 mA; -12 V, 400 mA; +5V, 100 mA Approximately 11 W
Signal Ground	Grounded

#### Environmental

Operating Temperature	0 $^{\circ}$ C - 50 $^{\circ}$ C, RH 80% (non-condensing)
Storage Temperature	-30 $^{\circ}$ C - 80 $^{\circ}$ C

(\*) Gain is configured in the factory. Always state the required gain at the time of your order.

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