

Model FTA820 and FTA420 Fast Timing Amplifiers Operating And Service Manual

This manual applies to instruments marked

FTA820A — "Rev 00"	FTA420A — "Rev 00"
FTA820B — "Rev 01"	FTA420B — "Rev 00"
FTA820C — "Rev 00"	FTA420C — "Rev 00"

Standard Warranty

for

EG&G ORTEC Nuclear Electronic Instruments

EG&G ORTEC warrants that the items will be delivered free from defects in material or workmanship. EG&G ORTEC makes no other warranties, express or implied, and specifically **NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

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Quality Control

Before being approved for shipment, each EG&G ORTEC nuclear electronic instrument must pass a stringent set of quality control tests designed to expose any flaws in materials or workmanship. Permanent records of these tests are maintained for use in warranty repair and as a source of statistical information for design improvements.

Repair Service

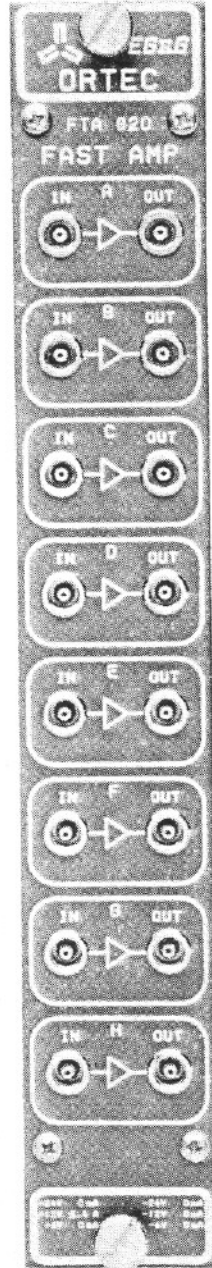
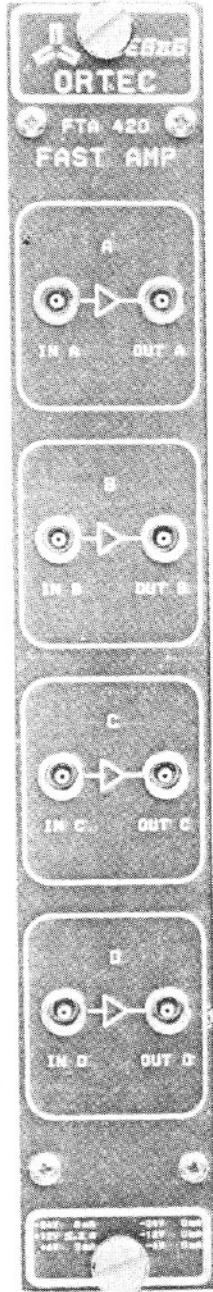
If it becomes necessary to return this instrument for repair, it is essential that Customer Services be contacted in advance of its return so that a Return Authorization Number can be assigned to the unit. Also, EG&G ORTEC must be informed, either in writing, by telephone [(615) 482-4411] or by telex (55-7450) of the nature of the fault of the instrument being returned and of the model, serial, and revision ("Rev" on rear panel) numbers. Failure to do so may cause unnecessary delays in getting the unit repaired. The EG&G ORTEC standard procedure requires that instruments returned for repair pass the same quality control tests that are used for new-production instruments. Instruments that are returned should be packed so that they will withstand normal transit handling and must be shipped **PREPAID** via Air Parcel Post or United Parcel Service to the nearest EG&G ORTEC repair center. (In the case where the instrument did not function upon purchase, EG&G ORTEC will pay shipment costs both ways.) The address label and the package should include the Return Authorization Number assigned. Instruments being returned that are damaged in transit due to inadequate packing will be repaired at the sender's expense, and it will be the sender's responsibility to make claim with the shipper. Instruments not in warranty will be repaired at the standard charge unless they have been grossly misused or mishandled, in which case the user will be notified prior to the repair being done. A quotation will be sent with the notification.

Damage in Transit

Shipments should be examined immediately upon receipt for evidence of external or concealed damage. The carrier making delivery should be notified immediately of any such damage, since the carrier is normally liable for damage in shipment. Packing materials, waybills, and other such documentation should be preserved in order to establish claims. After such notification to the carrier, please notify EG&G ORTEC of the circumstances so that assistance can be provided in making damage claims and in providing replacement equipment if necessary.

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FTA420/FTA820 "A" Version 747140	
" B " Version 747150	
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EG&G ORTEC MODELS FTA820 AND FTA420 FAST TIMING AMPLIFIERS

1. DESCRIPTION

The FTA820 and FTA420 amplifiers are high-performance, wide-bandwidth amplifiers designed for boosting very fast linear signals from photomultipliers, electron multipliers, silicon surface-barrier detectors, and other detectors used in fast timing applications. The rise time on all versions is <1 ns with a 5-V output, enabling excellent timing resolution.

The FTA820 (an 8-channel unit) and the FTA420 (a 4-channel unit) are single-width NIM modules. Each of these models is available with a gain of 200, noninverting (A version); a gain of 200, inverting (B version); or a gain of 20, noninverting (C version). LEMO type 00C50 connectors are used for all signal connections.

2. SPECIFICATIONS

2.1. PERFORMANCE

GAIN FOR EACH CHANNEL (10% gain tolerance on all versions):

- A Version** 200, noninverting.
- B Version** 200, inverting.
- C Version** 20, noninverting.

NUMBER OF CHANNELS:

- FTA820** 8.
- FTA420** 4.

RISE TIME ≤ 1 ns.

NOISE ≤ 20 μ V rms equivalent input noise.

BANDWIDTH 10 to 350 MHz.

PROPAGATION DELAY ≤ 30 -ps variation between channels.

OUTPUT RANGE 0 to -5 V with 50- Ω load.

INPUTS One for each channel. LEMO connector; input impedance 50 Ω .

OUTPUTS One for each channel. LEMO connector; 0 to -5 V output with a 50- Ω load. Output impedance ≤ 1 Ω .

2.2. ELECTRICAL AND MECHANICAL

POWER REQUIRED:

- FTA820** +12 V, 400 mA.
- FTA420** +12 V, 200 mA.

DIMENSIONS Standard single-width NIM module 3.43 \times 22.13 cm (1.35 \times 8.714 in.) per TID-20893 (Rev.).

WEIGHT 1 kg (2.2 lb).

3. INSTALLATION

The FTA820 and FTA420 contain no internal power supply and must obtain power from a NIM-standard bin and power supply. The bin and power supply should be turned Off when modules are inserted or removed. The power supply voltages should be checked after modules are inserted. Ensure that the

FTA820/FTA420 have sufficient cooling air circulating to prevent any localized heating of the solid-state circuitry used throughout the module. The FTA820/FTA420 should not be subjected to temperatures in excess of 50° C.

4. CIRCUIT DESCRIPTION

The FTA820 and FTA420 Amplifiers are available in three versions. The "A" version has a noninverting gain of 200, the "B" version has an inverting gain of 200, and the "C" version has a noninverting gain of 20. The schematic diagram for each version is attached at the end of this manual.

The FTA820 is composed of eight separate amplifiers, and the FTA420 is composed of four separate amplifiers. The amplifiers for each model are constructed on a single printed wiring board. Each section is identical, and the circuit description that follows relates to any of the four sections. Component designations are the same for each channel except that channel 1 components have a prefix of "1", channel 2 components have a prefix of "2", and so on for all four channels.

The schematic diagram for the FTA820A/FTA420A is attached at the end of this manual. The "A" version has five gain stages, 1Q1 through 1Q4 connected in the Common-Emitter configuration and 1Q5 connected in the Emitter-Follower configuration. Each stage is ac-coupled to isolate bias voltages and to strongly reject low-frequency components. Input protection is furnished by diode 1D1.

Consider the first stage formed around 1Q1. Resistor 1R2 furnishes base-injection bias for the transistor, the series combination 1C2 and 1R3 provides shunt feedback, and resistor 1R4 is an unbypassed emitter resistor which, along with 1C3, peaks the high-frequency response of the stage. Each of the other Common-Emitter stages operates in a similar manner with specific component values set for optimum gain distribution and rise time. The final two Common-

Emitter stages, 1Q3 and 1Q4, have variable peaking capacitors, 1C20 and 1C21, which are set in test to give an overall rise time of <1 ns. Transistor 1Q5 is connected in the Emitter-Follower configuration and provides excellent output drive capability, 0 to -5 V, and low output impedance, $<1 \Omega$.

The grounding for each section of the FTA820/FTA420 is isolated from the frame except at the front panel. Each individual amplifier section receives its circuit ground via coax to the front panel, and a high-quality ground connection must be maintained for proper operation.

The schematic diagram of the FTA820B/FTA420B at the end of this manual shows that the "B" version has one less Common-Emitter amplifier stage than does the "A" version. This causes an overall signal inversion from input to output. The operation of each stage is similar to that of the "A" version described above except for the distribution of gain and rise time among the various amplifier stages. Peaking capacitors 1C16 and 1C17 are set in test to give an overall rise time <1 ns.

The schematic diagram of the FTA820/FTA420 is also attached at the end of this manual. The "C" version has two less Common-Emitter amplifier stages than does the "A" version. There is no signal inversion from input to output, and the overall gain is nominally 20. The operation of each stage is similar to that of the "A" version except for the distribution of gain and rise time among the various amplifier stages. Peaking capacitors 1C3 and 1C7 are set in test to give an overall rise time <1 ns.

5. MAINTENANCE

The FTA820/FTA420 Fast Timing Amplifiers require very little maintenance other than routine removal of dust and tightening of mechanical connections.