

**Model FTA820A Octal Fast Timing Amplifier
and
Model FTA420C Quad Fast Timing Amplifier
Operating Manual**

Advanced Measurement Technology, Inc.

a/k/a/ ORTEC®, a subsidiary of AMETEK®, Inc.

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Quality Control

Before being approved for shipment, each ORTEC 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, ORTEC must be informed, either in writing, by telephone [(865) 482-4411] or by facsimile transmission [(865) 483-2133], 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 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 designated ORTEC repair center. 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 should follow the same procedure and ORTEC will provide a quotation.

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 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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CONTENTS

SAFETY INSTRUCTIONS AND SYMBOLS	iv
SAFETY WARNINGS AND CLEANING INSTRUCTIONS	v
1. DESCRIPTION	1
2. SPECIFICATIONS	1
2.1. PERFORMANCE	1
2.2. ELECTRICAL AND MECHANICAL	1
3. INSTALLATION	1
4. CIRCUIT DESCRIPTION	2
5. MAINTENANCE	2

SAFETY INSTRUCTIONS AND SYMBOLS

This manual contains up to three levels of safety instructions that must be observed in order to avoid personal injury and/or damage to equipment or other property. These are:

DANGER Indicates a hazard that could result in death or serious bodily harm if the safety instruction is not observed.

WARNING Indicates a hazard that could result in bodily harm if the safety instruction is not observed.

CAUTION Indicates a hazard that could result in property damage if the safety instruction is not observed.

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

In addition, the following symbol may appear on the product:



ATTENTION – Refer to Manual



DANGER – High Voltage

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

SAFETY WARNINGS AND CLEANING INSTRUCTIONS

DANGER Opening the cover of this instrument is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.

WARNING Using this instrument in a manner not specified by the manufacturer may impair the protection provided by the instrument.

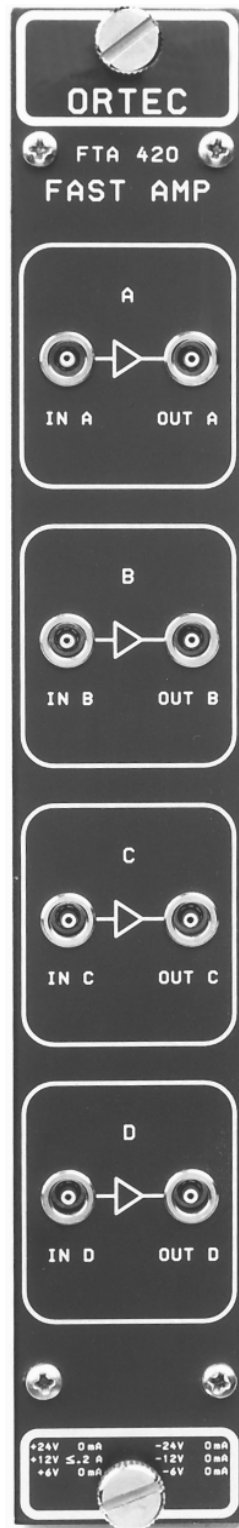
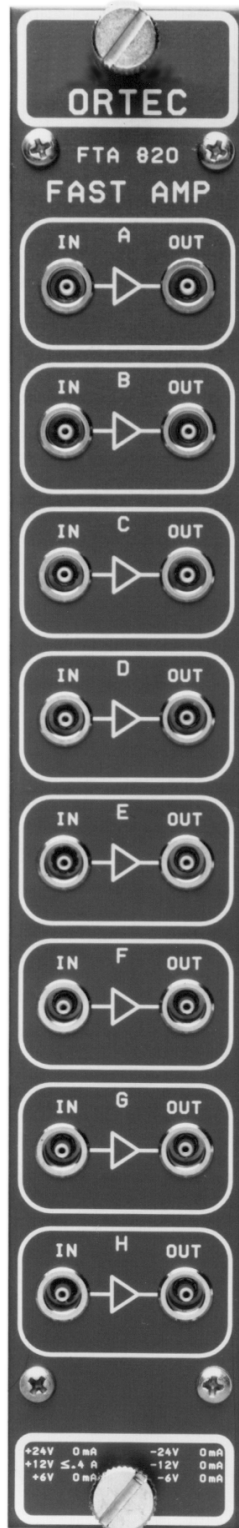
Cleaning Instructions

To clean the instrument exterior:

- Unplug the instrument from the ac power supply.
- Remove loose dust on the outside of the instrument with a lint-free cloth.
- Remove remaining dirt with a lint-free cloth dampened in a general-purpose detergent and water solution. Do not use abrasive cleaners.

CAUTION To prevent moisture inside of the instrument during external cleaning, use only enough liquid to dampen the cloth or applicator.

- Allow the instrument to dry completely before reconnecting it to the power source.



ORTEC MODEL FTA820A OCTAL FAST TIMING AMPLIFIER AND MODEL FTA420C QUAD FAST TIMING AMPLIFIER

1. DESCRIPTION

The Model FTA820A and FTA420C Fast Timing 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 both versions is <1 ns with a 5-V output, enabling excellent timing resolution.

Both units are single-width NIM modules. The FTA820A is an 8-channel unit with a gain of 200, noninverting. The 4-channel FTA420C offers a gain of 20, noninverting. LEMO type 00C50 connectors are used for all signal connections.

2. SPECIFICATIONS

2.1. PERFORMANCE

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

FTA820A	200, noninverting.
FTA420C	20, noninverting.

NUMBER OF CHANNELS

FTA820A	8
FTA420C	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 per channel. LEMO connector; input impedance 50 Ω .

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

2.2. ELECTRICAL AND MECHANICAL

POWER REQUIRED

FTA820A	+12 V, 400 mA.
FTA420C	+12 V, 200 mA.

DIMENSIONS Standard single-width NIM module, 3.4 cm \times 22.1 cm (1.35 in. \times 8.714 in.) per DOE/ER-0457T.

WEIGHT

Net	1 kg (2.2 lb).
Shipping	2.7 kg (5.9 lb).

3. INSTALLATION

The FTA820A and FTA420C 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 and removed. The power supply voltages should be checked after modules are inserted.

Ensure that the unit has sufficient cooling air circulating to prevent any localized heating of the solid-state circuitry used throughout the module. The FTA820A and FTA420C should not be subjected to temperatures in excess of 50°C.

4. CIRCUIT DESCRIPTION

The FTA820A Amplifier has a noninverting gain of 200. The FTA420C has a noninverting gain of 20.

The FTA820A is composed of eight separate amplifiers; the FTA420C has four separate amplifiers. The amplifiers 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 "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 operated 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 Ω .

The grounding for each section of the amplifier 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 "C" version has two fewer Common-Emitter amplifier stages than 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 FTA820A and FTA420C require very little maintenance other than routine removal of dust and tightening of mechanical connections. **Be sure to observe the cleaning instructions and safety warnings at the front of this manual.**

**Bin/Module Connector Pin Assignments for Standard
Nuclear Instrument Modules per DOE/ER-0457T**

Pin	Function	Pin	Function
1	+3 V	23	Reserved
2	-3 V	24	Reserved
3	Spare Bus	25	Reserved
4	Reserved Bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	*28	+24 V
7	Coaxial	*29	-24 V
8	200 V dc	30	Spare Bus
9	Spare	31	Spare
*10	+6 V	32	Spare
*11	-6 V	*33	117 V ac (Hot)
12	Reserved Bus	*34	Power Return Ground
13	Spare	35	Reset (Scaler)
14	Spare	36	Gate
15	Reserved	37	Reset (Auxiliary)
*16	+12 V	38	Coaxial
*17	-12 V	39	Coaxial
18	Spare Bus	40	Coaxial
19	Reserved Bus	*41	117 V ac (Neutral)
20	Spare	*42	High-Quality Ground
21	Spare	G	Ground Guide Pin
22	Reserved		

Pins marked (*) are installed and wired in ORTEC's Model 4001A and 4001C Modular System Bins.

