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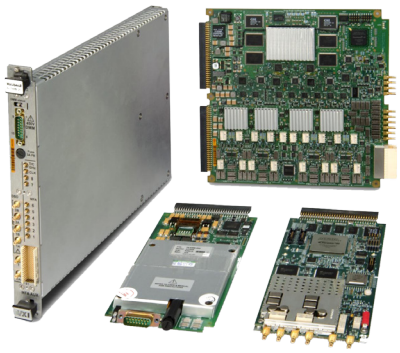
Find the *Teradyne AI-762-60* at our website: ***Click HERE***

# Ai-762 Analog Test Instrument

## Versatile C-size VXI Instrument for Defense and Aerospace Applications

Teradyne's Ai-762 analog test instrument allows systems integrators to create powerful, mixed-signal test equipment that yields lower costs for test systems and test programs.

The Ai-762 is a standards-based analog test solution that provides high-performance and flexibility for Defense and Aerospace test applications. The Ai-762 combines legacy functionality with advanced, parallel test capabilities. This powerful combination of features makes the Ai-762 the ideal analog test instrument to leverage past test program set (TPS) investment as well as capture the benefits of operational test.



As with all instruments in Teradyne's Core Systems Instrumentation (CSi) family, the Ai-762 combines greater levels of functionality and high-performance in a small form factor. The Ai-762 consolidates moderate frequency source and measurement instruments and provides solid coordination of analog subsystem test functions. With parallel source and measure capability to implement operational tests on UUTs and to increase TPS throughput, the Ai-762 is ideal for reducing test costs while increasing test coverage. This combination of functional density and unified control of multiple instruments enables system integrators to decrease tester footprint and increase test performance.

## FEATURES

- ***Physical Consolidation** of traditional instruments into a single system with increased functionality and decreased footprint*
- ***Complete Analog Subsystem** with Multi function Analog (MFA) Channels that increases system capabilities while lowering system operating costs and TPS development costs*
- ***Parallel Test** capability that facilitates operational test for higher throughput and quality of test*

(8) MFA Tester-Per-Pin Channels
- 200 MHz Timer/Counter
- 200 MS/s, 14 Bit ARB
- 50 MS/s, 12 Bit Digitizer

(1) 6.5 Digit Digital Multimeter (DMM)

(1) 2-Channel 2 GS/s Digital Sampling Oscilloscope (DSO)

CSi CORE SYSTEM INSTRUMENTATION

## A Complete Analog Subsystem Optimized for Operational Test

The Ai-762-20 is a full-featured analog subsystem with a digital sampling oscilloscope (DSO), digital multimeter (DMM) and eight (8) multifunction analog (MFA) tester-per-pin channels, each with an arbitrary waveform generator, a timer/counter, and a digitizer. This powerful combination of test assets makes the Ai-762-20 model an ideal instrument for securing the benefits of operational and parallel testing.

### Operational Test Capability

Operational test, where the tester emulates the operating conditions of the UUT, reduces overall test costs and risks because it expands the fault capture envelope during production and field testing. By reducing both the incidence of bad units passing production test and reducing the incidence of Return Test OK (RTOK) for failed UUTs, operational test leads to lower costs for both the UUT manufacturer and user.

Testing devices under operational conditions involves applying multiple stimuli and making multiple measurements in parallel. All stimulus and measurement channels must have full test capability while operating both independently and simultaneously. With this capability, the Ai-762 can expose the UUT to operational conditions and measure the UUT's response.

### Parallel Test Capability

In addition to being a pre-requisite for operational testing, parallel test capability leads to reduced costs and risks through improved test quality and reduced TPS run time. Finding defects that involve interactions between multiple UUT ports is difficult using sequential testing and single-channel, single-function test instruments. By contrast, parallel testing makes it possible to test multiple ports simultaneously searching for problems caused by faulty UUT channel interaction.

### Tester-Per-Pin Architecture

Complete, cost-effective parallel test requires multiple test channels where each channel can both provide stimulus and measure response. Also, channels must operate independently and simultaneously. Systems that depend on switch matrices and multiplexers to route signals to scarce central test resources cannot adequately provide parallel test capability.

The tester-per-pin architecture of the Ai-762 MFA provides effective parallel analog test. Each MFA channel has dedicated stimulus and measurement test instruments that can be used simultaneously to perform tests either independently of, or in synchronization with, other MFA channels.

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# Ai-762 Analog Test Instrument

## Ai-762 Configurations

Four single-slot Ai-762 configurations are available to fit the systems integrator's analog test requirements:

1. Ai-762-20
2. Ai-762-10
3. Ai-762-70
4. Ai-762-60



### Ai-762-20

This full featured analog subsystem offers the highest level of instrument consolidation. The Ai-762-20 consists of a 2 GSa/s DSO with a 600 MHz input bandwidth, an 8-channel MFA module, and a 6.5 digit DMM.

### Ai-762-10

This lower cost configuration consists of an 8-channel MFA module and 6.5 digit DMM.



### Ai-762-70

The Ai-762-70 consists of 16 high-performance MFA channels in a single-slot VXI card.

### Ai-762-60

The Ai-762-60 consists of 8 high-performance MFA channels in a single-slot VXI card.

Multiple Ai-762 cards can be added to a tester to provide the right level of test performance.

Each of the four standard Ai-762 configurations is comprised of one or more the following instrument modules:

1. Ai-762 DSO
2. Ai-762 DMM
3. Ai-762 MFA



### Ai-762 DSO

Teradyne's Ai-762 DSO is designed to meet ATE system integrators' needs. It provides high-speed, high-bandwidth data acquisition channels, and has four (4) front panel inputs multiplexed to the two acquisition channels. Each channel is independently capable of a 2 GHz sample rate. The 2:1 multiplexer of each channel is optimized to maintain the Ai-762 DSO's 600MHz input bandwidth for all inputs. As a result, integrators can wire each of the two acquisition channels to their ITA and still have a second probe input signal for each channel.

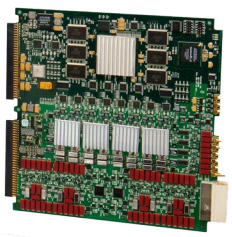
The Ai-762 DSO also has an external trigger input and an external clock input. By connecting the test system trigger to the external trigger, signal capture can be synchronized with other test system test events.

### Ai-762 DMM



The Ai-762 DMM is a high-performance 6.5 digit multimeter designed for ATE system demands, having a wide spectrum of measurement ranges as well as robust protection from overvoltage/ overcurrent conditions. Measurement capabilities for AC and DC voltage range from millivolt readings with nanovolts of resolution to 300 V with microvolts of resolution. Similarly for current measurements, the Ai-762 DMM can measure milliamps of current with nanoamp resolution and up to 3 Amps with microamp resolution. The multimeter has both 2-wire and 4-wire resistance modes offering integrators the ability to optimize for either measurement speed or measurement accuracy. These measurement capabilities are protected with a maximum, non-destructive input range of 450 V, a ±200 V maximum common mode voltage, and a 3A 250V fuse.

### Ai-762 MFA



Teradyne's Ai-762 MFA is an eight channel multi-function analog instrument subsystem that gives the system integrator the ability to decrease test program costs while increasing test coverage not just by providing more instrumentation in a smaller package, but by also enabling parallel test via the tester-per-pin architecture. Each MFA channel offers the following high-performance functions on a per-pin basis:

- 200 MSa/s Arbitrary Waveform Generator (AWG)
- 50 MHz Digitizer
- 200 MHz Timer/Counter

In addition to the 8 multi-function pins, the Ai-762 MFA instrument also contains a 2.4 GHz Timer/Counter input for high frequency measurements.

### Waveform Generation

Each of the 8 AWGs can be used as an independent AWG, or multiple channel AWGs can be used as a single, multi-channel AWG providing compatibility with legacy AWGs and TPS programming methods. Every AWG has its own 4 Msamples of memory for specifying either a single waveform or for segmenting into up to 4096 different waveforms. Each AWG is also a standard function generator for producing the following standard waveforms:

- Arbitrary
- Sine
- Triangle
- Pulse
- AM
- FSK
- DC
- Square
- Ramp
- Double-pulse
- FM

### Digitizing Waveforms

Each of the 8 Ai-762 MFA digitizers can be used independently to acquire data at up to 50 MHz. Every MFA digitizer has its own 4 Msamples of memory for data capture. In addition to the selectable input impedance (50Ω or 1 MΩ) of each MFA channel, the digitizer also provides integrators with flexibility of 6 input voltage ranges (±100mV, ±300mV, ±1V, ±3V, ±10V, ±15V) for optimizing the 12-bit resolution to the voltage range of the input signal.

The digitizer of an MFA channel can be used simultaneously with the AWG and timer/counter of the same channel. This makes it possible to monitor the stimulus signal from the Ai-762 MFA to verify that the desired test signal is being output

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during load conditions and to test for unexpected load conditions that may indicate a failed UUT, failed ITA, or failed instrument-to-UUT connection.

### Timer/Counter Measurements

Each of the 8 Ai-762 MFA timer/counters can be used independently to perform accurate time and event measurements. With an input signal frequency range of 1 mHz to 200 MHz and an event count range of 1012-1, these timers/counters can handle a wide range of test applications.

The Ai-762 MFA also contains a single dedicated higher frequency timer/counter input for making measurements up to 2.4 GHz.

As with the digitizer, the timer/counter of an MFA channel can be used simultaneously with the other instruments of the same channel. This makes it possible to not only monitor the stimulus signal for unexpected load conditions, but it also makes it possible to simultaneously perform fast, highly accurate timing/counting measurements while acquiring and storing the input waveform.

### iStudio for the Ai-762

The Ai-762 is backed by iStudio, a comprehensive graphical user interface (GUI) used for development and debugging. iStudio features an Analog Test Editor for programming and editing stimulus and measurement steps that create an analog test. It is a productive complement to existing Applications Development Environments (ADE) and test executives. iStudio can be used interactively on the test system, or stand-alone on a computer with instrument simulation. These attributes make iStudio a good tool to learn and experiment on the Ai-762 instruments.

iStudio is an effective tool for increasing TPS developers' productivity both as a development tool and a debugging tool. Using the iStudio Analog Test Editor, programmers can develop and test the configuration and control functions of the Ai-762 required to perform stimulus and measurement operations. Additionally, TPS developers have the option of creating an analog test sequence in the Analog Test Editor and saving the test sequence as a project that can be executed using a single call from a TPS written in standard programming language like C, C#, Visual Basic, or ATLAS.

## Arbitrary Waveform Generator Specification (MFA Channel Function)

### General Specifications

| | |
|---|---|
| Number of Channels | 8 single-ended |
| Standard Waveforms | Arbitrary, DC, Sine, Square, Triangle, Ramp, Pulse, Double-pulse, FSK, AM, FM |
| Max Sample Rate | 200 MSa/s |
| Resolution | 14 bits |
| Memory Depth | 4 MSa per channel |
| Channel-to-channel Skew | ≤ 10 ns for standard waveforms |
| Input Trigger Sources | Any MFA channel, Front panel triggers, Software, Internal or VXI triggers |
| Trigger Modes Retrigger | Start, Advance Sample, Advance Segment, |
| Trigger Delay Range | 0 ns to 21s, 5 ns resolution |
| Trigger Event Count Range | 1 to 65,535 |

### Output Characteristics

| | |
|---|---|
| Voltage Output | 30 $V_{pp}$ open, programmable |
| Source/sink Current | ±100 mA, ±200mA using paired channels |
| Amplitude, slew rate | > 1000 V/ µs |
| Offset Resolution | 47 uV to 5 mV depending on output range |
| Amplitude & Offset Accuracy | 1% of setting 0.4% of range |

### Sine Wave

| | |
|---|---|
| Frequency Range | 5 µHz to 25 MHz |
| Initial Phase Range | 0 to 360° |
| Phase Resolution | 0.05° |
| THD | <-34 dBc (to 25 MHz) |
| SFDR | > 50dB |

### Square Wave

| | |
|---|---|
| Frequency Range | 5 µHz to 25 MHz |

### Triangle/Ramp Waveform

| | |
|---|---|
| Frequency Range | Up to 2 MHz |

### Pulse Waveforms

| | |
|---|---|
| Frequency Range | 5 µHz to 25 MHz |
| Pulse Width Range | 10 ns to 200,000 s |

### Double Pulse

| | |
|---|---|
| Spacing (Delay) Range | 0 ns to 21 s |
| Spacing Resolution | 5 ns |

## Timer/Counter Specification (MFA Channel Function)

### General Specifications

| | |
|---|---|
| Number of Channels | 8 single-ended |
| Measure Modes | Count Events, Duty Cycle, Frequency, Frequency Ratio, Period, Period Averaging, Pulse Width, Time Interval Input |
| Trigger Sources | Any MFA channel input, Front panel triggers, Software, Internal or VXI triggers |

### Input Characteristics & Resolution

| | |
|---|---|
| Max Frequency | 200 MHz, Pulse and repetitive<br>2.4 GHz using High Speed T/C input |
| Input Impedance | 1MΩ or 50Ω |
| Max Input | 40 $V_{RMS}$ (1 MΩ), 5.5 $V_{RMS}$ (50Ω) |
| Time Interval Range | 1 ns – 17,592s |
| Frequency Resolution | ± 1 ns (additive errors: trigger, frequency/gate, and time) |
| Event Count Range | 1 to $10^{12}$ – 1 |

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# Ai-762 Analog Test Instrument

## Specifications

### Digitizer Specification (MFA Channel Function)

#### General Specifications

| | |
|---|---|
| Number of Channels | 8 single-ended |
| Sample Rate | 20 S/s to 50 MS/s |
| Resolution | 12 bits |
| Acquisition Memory | 4 Million samples per channel |
| Input Trigger Sources | Any MFA channel input, Front panel triggers, Software, or VXI triggers |

#### Input Characteristics

| | |
|---|---|
| Bandwidth | DC to 25 MHz |
| Input Impedance | 1 MΩ or 50Ω |
| Coupling | AC or DC |
| Maximum Input | ±15 V peak (5 $V_{RMS}$ when using 50Ω input impedance) |

### Multi-Function Analog (MFA) Channel Specifications

#### General Specifications

| | |
|---|---|
| Number of Channels | 8 single-ended |
| Functions per Channel | Arbitrary Waveform Generator<br>Digitizer<br>Timer/Counter<br>Trigger |
| Input Impedance | 50Ω or<br>1 MΩ in parallel with 130 pF |
| Input Range | 50Ω: 5 $V_{RMS}$<br>1 MΩ: ±15 V |
| Maximum Input without Damage | 50Ω: 5 $V_{RMS}$<br>1 MΩ: ±55 V (DC to 20 kHz, decreasing to 12 $V_{RMS}$ above 20 kHz) |

#### MFA Channels as Trigger Specifications

| | |
|---|---|
| Input Voltage Range | 50Ω: 5 $V_{RMS}$<br>1 MΩ: ±10 V |
| Input Frequency Range | DC to 25 MHz |
| Trigger Level Resolution | 0.24% of input range (24µV to 3.7 mV) |
| Trigger Levels per Channel | 2 |
| Trigger Level Accuracy | ± 150mV ± 2% of trigger level |
| Trigger Slope | Positive or negative |
| Sensitivity | 100 mV for 5 ns or larger pulses |

### Digital Sampling Oscilloscope Specifications

#### Acquisition Input Channels

| | |
|---|---|
| Number of Channels | 4 inputs multiplexed to 2 channels |
| Bandwidth | DC to 600 MHz (50Ω) |
| | DC to 200 MHz (1 MΩ) |
| Maximum Sampling Rate | 2 GSa/s for each of 2 channels |
| Minimum Sampling Rate | 5 Sa/s for each channel |
| Equivalent Time Sampling Rate | 100 GS/s |
| Resolution | 8 bits |
| Time Base Sources | VXI CLK 10 or EXTCLK input |
| Maximum Input | ±250 V(DC + peak AC) (1 MΩ)<br>±450 V with 10:1 divider probe<br>5 VRMS (50Ω) |
| Full Scale Range | 500 $V_{pp}$ at maximum setting |
| Vertical Sensitivity | 1 mV/Div to 5 V/Div |
| Input Filtering | Bypass or 30 MHz |
| Coupling | DC or AC |
| AC Coupling Cutoff | 50Ω: > 70 kHz<br>1 MΩ: > 7 Hz |
| Impedance | 50Ω or 1 MΩ with 22 pF (typ.) |
| Channel Isolation | DC to 100 MHz: 40 dB<br>100 to 600 MHz: 30 dB |

#### External Trigger Input

| | |
|---|---|
| Input Impedance | 50Ω: ± 5% |
| Input Coupling | AC, DC |
| Trigger Slope | Positive or negative |
| Threshold | 50Ω: ±4.5 V<br>1 MΩ: ±10 V |
| Minimum Pulse Width | 20 ns |

### DMM Specifications

#### General Specifications

| | |
|---|---|
| Measurement Modes (Inputs) | DCV, $ACV_{RMS}$ (HI, LO), DCI, $ACI_{RMS}$ (I+, LO),<br>2-wire Resistance, Frequency/Period (HI, LO),<br>4-wire Resistance (HI, LO, Sense HI, Sense LO) |
| Voltage Measurements | Up to ±300 volts DC or AC |
| Current Measurements | Up to 3 Amps |
| Resistance Measurements | Up to 100 MΩ (full scale) |
| Trigger Modes | Start or Arm measurement |

#### Ranges

| | |
|---|---|
| DC/AC Voltage | 100 mV, 1 V, 10 V, 100 V, 300 V |
| DC Current | 1 mA, 10 mA, 100 mA, 1 A, 3 A |
| AC Current | 10 mA, 100 mA, 1 A, 3 A |
| Resistance | 100 Ω 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ, 100 MΩ |

#### Resolution

| | |
|---|---|
| DC & AC Voltage Resolution | 10 nV, 100 nV, 1 µV, 10 µV, 10 µV respectively for each range |
| DC Current Resolution | 100pA, 1 nA, 10 nA, 100 nA, 100nA respectively for each range |
| AC Current | 1 nA, 10 nA, 100 nA, 1µA respectively for each range |
| Resistance | 10 µΩ, 100 µΩ, 1 mΩ, 10 mΩ, 100 mΩ, 1 Ω, 10 Ω |

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