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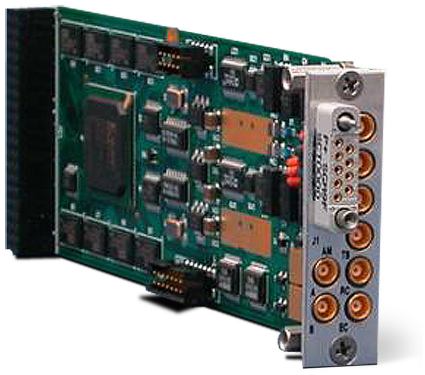
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Talon Instruments™ MA1801A

MA-Module Dual Arbitrary Waveform Generator

The Talon Instruments™ MA1801A is a single width ANSI standard MA-Module that contains two 14-bit Arbitrary Waveform Generator (AWG) channels which can operate independently or in synchronization. The maximum sample rate is 125 MS/s. Dual ping-pong buffers are available. This allows you to switch on-the-fly between freshly loaded waveforms without glitch or disruption of the waveform that is currently playing.

Key Features

- **Register-based for high speed operation**
- **Ping-pong memory architecture supports on-the-fly waveform update**
- **10 V_{pk-pk} output into 50 Ω (20 V_{pk-pk} into high impedance)**
- **Modular design supports low-level sparing for better maintainability**
- **Powerful sequencer supports Insert/Replace, Pseudo-Random Noise And Nested Looping And Branching**
- **Highest density dual waveform generator for VXI/PXI/PCI/VME/ Ethernet**

Built-In Waveforms

Standard waveforms such as Sine, Square, Triangle, Ramp and Pulse are calculated and loaded into waveform memory automatically based on their specified parameters. Pseudo-random noise (white, gaussian or pink) generated on-the-fly or a DC level can be injected into an output waveform in place of the waveform stored in memory. AM modulation inputs are also provided for each AWG channel.

Flexible Memory Buffers

A large 2-page waveform memory (512 k samples/page) is provided so that multiple waveforms can be loaded into memory for fast test execution. Also, the contents of one page can be output while the other page is being loaded with fresh data, allowing for real-time operation.

Powerful Sequencer

Powerful sequencing features allow waveform segments to be looped and output in any order. There are also provisions for jumping to different sequences based on a trigger input (with or without return). A sync bit can be placed anywhere in the waveform. Similarly, at any point during the output of a waveform, an alternate waveform can replace the waveform being output for a defined number of samples.

Channel Synchronization

Both AWG channels may be operated independently or in synchronization. In addition, up to 4 MA1801A's can be synchronized together using a synchronization cable accessory.

High Density & Modularity

The small size and high performance of the dual channel MA1801A make it ideal for use in high channel-count applications. The module can be used with a carrier in VXI (up to four per single slot), VME (drivers not supplied), PXI or cPCI (up to 4 channels per slot), PCI or even Ethernet platforms. This reduces the size and cost of the system while improving system granularity and maintainability.

Powerful Soft Front Panel

The M1801A Soft Front Panel (SFP) gives you full control of standard waveforms, and also allows for the editing of arbitrary waveform segments and waveform sequences. The segment editor allows you to load waveforms edited with another program such as WaveCAD or Microsoft Excel® spreadsheet software for further editing and loading to the instrument. The sequence editor allows you to define and modify sequences on the fly. It is also possible to monitor events on both channels during a test on channels A and B, as shown in Figure 1 on page 2.

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Product Information
continued



Figure 1: Event Monitoring Panel

High-End Sequencer Feature

The MA1801A sequence generator is a very powerful tool that links waveform segments. The sequence logic is useful for generating long waveforms with looped sections and multiple nesting levels. The looped waveform only has to be programmed once and the sequencer will loop sequenced segment the required number of times. When in sequenced mode, there is no loss of time between linked or looped segments. Each channel has its own dedicated sequence generator, even in master-slave mode.

Sequence memory must be loaded into the generator before sequenced waveforms can be generated. The sequence memory contains 512 steps where each step specifies the waveform, repeats, loop count and advance mode from the following choices:

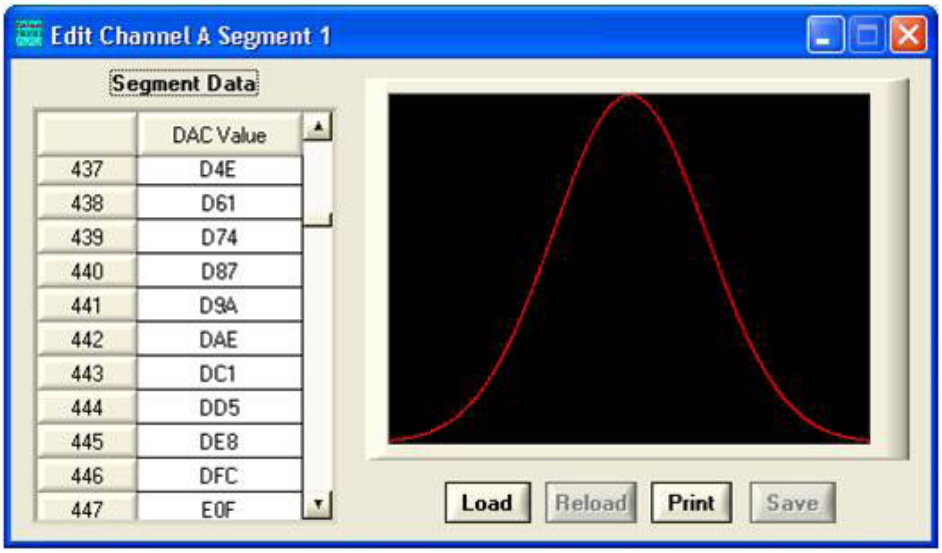


Figure 2: Waveform Segment Edit Panel

STEP: Continuously outputs sequence step until trigger is received.

SING: Outputs the specified number of loops and then idles until a trigger is received.

SING1: Outputs the step one time, idles until a trigger is received, and repeats until the specified number of loops complete. The next trigger advances to the next step.

Channel Coupling Features

MA1801A channels can be synchronized either within an MA1801A and between two or more MA1801A units may be synchronized as shown in Figure 3.

When multiple units are synchronized, channels may be delayed from each other with a resolution of 2 clock cycles. Coupled channels share the same master clock, but each channel can have a unique clock divider to obtain a degree of frequency independence between coupled channels.

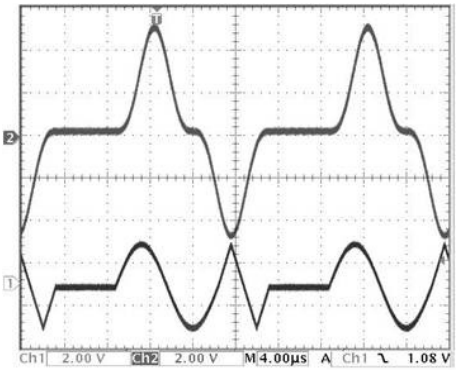


Figure 3: Coupled Channels

Unique "Replace" Feature

The MA1801A has a unique feature that allows the user to replace the current waveform data during a sync pulse cycle with a different segment of waveform memory. Figure 4 shows an example of the replace feature where a staircase waveform replaces part of a triangle wave while the sync pulse is low. The replace feature is useful for injecting random errors into a test signal. A DC level or noise can also be injected using the replace feature.

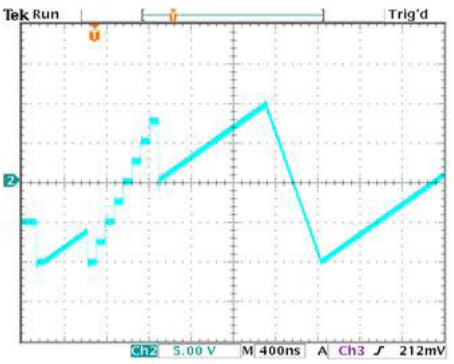


Figure 4: "Replace" Feature

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Specifications

Note: The Astronics Test Systems policy is one of continuous development and improvement. Consequently, the equipment may vary in detail from the description and specifications in this publication.

Amplitude Characteristics

Amplitude
- STD:
  200 mV to 20 V_{pk-pk} into 1 MΩ
  100 mV to 10 V_{pk-pk} into 50 Ω
- S066:
  100 mV to 10 V_{pk-pk} into 1 MΩ
  50 mV to 5 V_{pk-pk} into 50 Ω
- S2604:
  25 mV to 2.5 V_{pk-pk} into 1 MΩ
  12.5 mV to 1.25 V_{pk-pk} into 50 Ω

Resolution
- 3.5 digits

Accuracy (at 1 kHz and specified output)
- STD, S066: 50 mV
- S2604: 20 mV

DC Offset
- Range STD, S066: 0 to ±10 V
- Range S2604: 0 to ±1.25 V
- Accuracy: 1% + 50 mV

Output Impedance
- 50 Ω ±1%

Low-Pass Filter (selectable)
- 50 MHz, 7-pole, elliptic

Standby (Output disconnected)
- Output On or Off

Output Protection
- Short circuit up to ±12 V

Standard Waveforms

(Sine, Triangle, Square, Pulse, Ramp, Noise, DC.)

Sine Function

Frequency Range
- 1 mHz to 25 MHz

Phase Range
- 0 to 360º

Distortion (1 to 10 V_{pk-pk})
- <100 kHz: <0.1%

Harmonics
- <5 MHz: >45 dBc
- <10 MHz: >40 dBc
- <25 MHz: >60 dBc (filter on)

Flatness
- <10 MHz: 1.2 dB

SFDR (SCLK = 100 MHz)
- <1 MHz: >50 dBc

Crosstalk (fc = 10 MHz)
- -70 dB, typical

Triangle/Ramp/Pulse Function

Frequency Range
- 1 mHz to 10 MHz

Phase Range
- 0 to 360º

Square Wave Function

Frequency Range
- 1 mHz to 25 MHz

Duty Cycle Range
- 1% to 99% Rise/Fall Time

Rise/Fall Time
- 15 ns

Noise and DC Functions

Types
- White, quasi-gaussian or pink noise, or DC

Generation
- Real-time, pseudo-random

Period
- Pre-defined (min and max samples specifiable) or pseudo-random

Arbitrary Waveforms

(Per Channel)

Waveform Memory
- 512 k points in each of two pages per channel

Memory Operation
- One page can be outputting data while the other page is being re-loaded with new data.

Vertical Resolution
- 14 bits

Minimum Segment Size
- 2 pts

Segments/Channel
- 1 to 512

Sequenced Waveforms

(Per Channel)

Sequencer Step Limits
- 512

Segment Loops
- 1 to 64 k or continuous

Sweep Waveforms

Sweep Range
- Sine: 1 mHz to 25 MHz
- Square: 1 mHz to 20 MHz
- Triangle:1 mHz to 12.5 MHz

Waveforms
- Sine, square, triangle

Type
- Linear, logarithmic

Direction
- Up or down

Sweep Duration
- 200 µs to 335 s

Sampling Clock

(One Per Channel)

Frequency Resolution
- ~ 4 digits

Accuracy
- 50 ppm (internal crystal)

Jitter
- <30 ps rms

SCLK Source Range
- Internal: 1 Hz to 125 MHz
- External: Up to 100 MHz

External Source Characteristics
- Connector: Front Panel MCX Range: 50 mV_{pk-pk} to ±5 V
- Threshold: ±4.75 V, programmable
- Impedance: 50 Ω

Reference Clock

Internal Reference
- 10 MHz ±50 ppm

External Reference
- Impedance: 50 Ω
- Range: 50 mV_{pk-pk} to ±5 V
- Threshold: ±4.75 V, programmable

Triggering Characteristics

(Per Channel)

Sources
- External Analog(2): 50 mV_{pk-pk} to ±10 V
- Input Impedance: 10 kΩ ±5%
- Level (Programmable): ±9.75 V
- Resolution: 5 mV
- Accuracy: 100 mV
- External Digital (2): TTL
- Internal Timer (2): 20 µs-1.3 s; 20 µs res
- M-Module Triggers: TRIGA, TRIGB
- Other Sources: Markers, Ext Master

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Specifications
continued

Trigger Modes
- Triggered, Gated, Burst (1 to 1 M cycles)

Maximum Trigger Frequency
- DC to 20 MHz

Trigger Slope
- Positive or negative

Trigger Delay
- 0 to 128 k points (multiple of 2)

System Delay (trig/gate input to wfm output)
- 20 ns + 7 Sample Clocks

Sync Output (MA1801A/3164P)
- Front Panel: LVTTL
- M-Module Triggers: TRIGA, TRIGB
- Sync Starting Point Reference: Sequence start, sequence step start, each loop of sequence step, counted sequence step, offset 0 to 2M points
- Sync Width: 1 to 4097 points, programmable

Marker Output (MA1801A/3164P)
- Front Panel: LVTTL
- M-Module Triggers: TRIGA, TRIGB
- Marker Sources (2): HI or LOW on a segment, portion of a segment, or on individual memory words within a segment

Amplitude Modulation
(Per Channel)

Input Impedance/Range
- 10 kΩ ±5%/~2 V_{pk-pk} for 90% modulation

AM Depth Range
- 0 to 90% at half amplitude

Interface Data
(Single-wide MA-Module, ANSI/VITA Std. 12-1996 Compliant)

Master/Slave Connector
- Allows synchronization of 2 to 4 MA1801As

Peak Current & Power Consumption
- Total Power: 12 W

I_{Peak}(A)	+12	+5	-12
	0.2	1.2	0.3

Front Panel I/O
(See 3164 data sheet for 3164 I/O)

Inputs (MA1801A/3164P)
- Trigger/Gate (2/chan): Z_{in} = 10 kΩ, ±9.75 V
- External Sample Clock: 50 Ω, ±4.75 V
- External Reference: 10 MHz, 50 Ω, ±5 V
- AM (2): MCX, 10 kΩ, 2 V_{pk-pk} for 90% depth

Outputs (MA1801A/3164P)
- Waveform (2): MCX, Z_{out} = 50 Ω
- Marker/Sync Pulse (2/chan): 74LVC244

Software

Drivers (VXI, PXI and Ethernet Support)
- MA1801A/3164P: VXI*plug&play*
- 3164-2/4: IVI (C and Com)
- 3164-WT: WaveTEK SCPI emulation

Environmental

Temperature
- Operating: 0° C to 50° C
- Storage: -40° C to 70° C

Humidity (non-condensing)
- 11° C to 30° C: 95% ±5%
- 31° C to 40° C: 75% ±5%
- 41° C to 50° C: 45% ±5%

MTBF (ground benign)
- TBD

EMC (Council Directive 89/336/EEC)
- Emission: EN61326-1: 1997+ A1:1998, Class B
- Immunity: EN61326-1:1997+ A1:1998, Table 1

Safety (Low Voltage Directive 73/23/EEC)
- BS EN61010-1:1993/A2 1995

Mechanical

Weight
- 4 oz (0.11 kg)

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Ordering Information

MA1801A : Talon Instruments™ MA1801A
Dual Channel Arbitrary Waveform Generator MA-Module

MA1801AS062 : Talon Instruments™ MA1801A/S062
MA1801A with Fast Risetime option

MA1801AS063 : Talon Instruments™ MA1801A/S063
MA1801A with Fast Risetime option and single channel 3 $V_{pk\text{-}pk}$ option

MA1801AS064 : Talon Instruments™ MA1801A/S064
MA1801A with Fast Risetime option and dual channel 3 $V_{pk\text{-}pk}$ option

MA1801AS065 : Talon Instruments™ MA1801A/S065
MA1801A with single channel 5 $V_{pk\text{-}pk}$ option

MA1801AS066 : Talon Instruments™ MA1801A/S066
MA1801A with dual channel 5 $V_{pk\text{-}pk}$ option

Pre-configured VXI Modules:

VX405C-S-2272-2 : 3164-2 VXI Dual Channel Arbitrary Waveform Generator
VX405C-S-2272-4 : 3164-4 VXI Quad Channel Arbitrary Waveform Generator
11027050S2330 : 3164-WT VXI AWG, Wavetek 1396 emulation
VX405C-S-2523A : 3164-WT-AM VXI AWG, Wavetek 1396 emulation with AM and filter

Pre-configured PXI/PCI Modules:

MA1801A-S-2643 : 3164P-2 Dual Channel PCI Arbitrary Waveform Generator

Accessories:

11027050-0001 : VX405C Hex M/MA-Module Carrier for the VXI Bus
11028850-0001 : EM405D Dual M/MA-Module Carrier for Ethernet
11028380-0001 : AMi3000 Single M/MA Module Carrier for cPCI
11029140-0001 : AMi3002 Dual M/MA Module Carrier for 3U cPCI/PXI*
11029140-S-2355 : AMi3002 Dual M/MA Module Carrier for 3U cPCI/PX
MA/300-L : MCX to SMA Cable, L = 1' to 6' (customer to specify)
MA/302-L : MCX to MCX Cable, L = 1' to 6' (customer to specify)
MA/303-L : J1 to Pigtail Cable, L = 1' to 6' (customer to specify)

* Note: This product requires a PXI/cPCI mainframe with replaceable card guides. Low-profile card guides per the Eurocard mechanical specification for 111.5 mm Eurocards are provided with this product. Contact Astronics Test Systems for a list of compatible PXI mainframes.

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