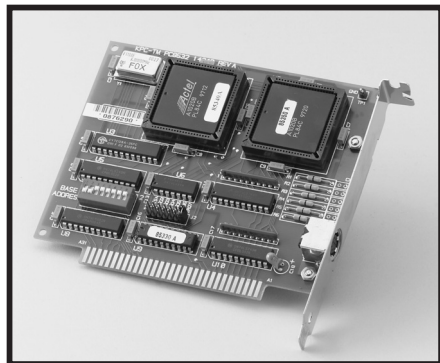# Trigger Accessories

Model KPC-TM/3.5: Trigger Master Controller with software on a 3½-in disk

Trigger Master is a high-performance trigger controller for instruments with external triggering. It is available as an ISA-bus plug-in board (KPC-TM) for the PC/XT/AT computer.

IEEE-488 instrument users have discovered that data transfer rates are not the only bottleneck to higher testing throughput. In many cases, trigger latency, the delay between trigger command and measurement, slows testing because of the length and uncertainty of the time needed to interpret the trigger commands. Trigger Master addresses trigger latency and timing uncertainty by generating precisely timed external trigger inputs.

The heart of the Trigger Master is a special-purpose high-speed microcontroller (patent pending) that responds to an instrument's external trigger output and produces external trigger inputs. The programmer can specify time delays, repeats, and nested looping to create simple or complex trigger sequences. This gives the programmer complete control over trigger and measurement timing on one or multiple instruments. The whole test sequence can be coordinated by the Trigger Master, eliminating trigger latency and timing uncertainty and reducing measurement delays by as much as a factor of ten.

ACCESSORIES AVAILABLE

8501-1	Trigger Link Cable, 1m (3.3ft)
8501-2	Trigger Link Cable, 2m (6.6ft)
8502	Trigger Link to BNC Cable Adapter Box with 1m (3.3ft) Cable

INPUT/OUTPUT CHANNELS: 6.

BASIC FUNCTIONS: Trigger detection, trigger generation, delay generation, PC interrupts.

MICRO SEQUENCER:
 Looping: 2 levels.
 Loop Repeat: 1–4096.
 Step Repeat: 1–4096.

SEQUENCER RAM: 1024 words (300 instructions typ.).

TRIGGER INPUTS/OUTPUTS: TTL compatible, Trigger-Link compatible.

TIME BASE DRIFT: 100ppm maximum.

TRIGGER INPUT PULSE WIDTH: 400ns minimum.

TRIGGER OUTPUT PULSE WIDTH: 5μs.

DETECTION LATENCY: 900ns maximum.

ASYNC TRIGGER LATENCY: 2.2μs max. (trigger in to trigger out).

Model 8501-1: 1m (3.3 ft) Trigger Link cable. Each end contains an 8-pin male DIN connector. Also available in 2m (6.6 ft) length (**Model 8501-2**).

For use with: Trigger Link inputs, 708A (for master/slave control)

Model 8502: Trigger Link adapter box has two female 8-pin micro DIN connectors to 6 female BNC connectors. Includes an 8501-1 cable.

For use with: 2000 Series, 2400 Series, 7001, 7002

Model 8503 DIN-to-BNC Trigger Cable: 1m (3 ft) cable used to connect BNC inputs to any instrument having Trigger Link connectors.

For use with: 2000, 2010, 2400, Trigger Link inputs

Model 8505: Male to 2-female Y-DIN cable.
For use with: Trigger Link

KEITHLEY

A GREATER MEASURE OF CONFIDENCE

Trigger Accessories

- **Improve system throughout**
- **Trigger UP to six instruments**
- **Automatically route TTL signals**
- **Speed operation of multiple Source-Measure Units**

Ordering Information

2361   Trigger Controller Unit with 7051-2 BNC Interconnect cable, 0.6m (2 ft)

Accessories Supplied

7051-2   BNC Interconnect Cable (4)

The **Model 2361 Trigger Controller Unit (TCU)** puts TTL, trigger routing and coordination under GPIB control for rack and stack systems. This compact unit connects to the trigger inputs and outputs of up to six instruments using BNC cables. All triggers in the system are passed through the 2361 Trigger Controller to allow:

- Automatic trigger routing between instruments.
- Conditional and simultaneous triggering.

Applications

The 2361 will control test systems of two to six Source-Measure Units (SMUs), DMMs, switches, or other GPIB instruments. It allows trigger input and output signals from instruments in a test system to be arbitrarily directed without changing cable connections. This provides complete flexibility in test design with reduced operator intervention and without sacrificing the speed and synchronization.

Advanced Triggering Capabilities

Six trigger relations may be programmed using GPIB commands to specify which trigger inputs will result in a particular group of outputs. "OR" causes a trigger output when a trigger is received on any one specified channel. "AND" accumulates triggers until one has been received on each of the specified channels and then generates the trigger outputs. This is especially useful for allowing multiple sources or SMUs in a test system, to settle concurrently, then multiple meters or SMUs to measure in unison. The result is two to ten times faster test execution than with serial trigger loops.

A digital I/0 port provides 8 bits of TTL inputs and 8 bits of TTL outputs. SRQs may be generated by changes in the digital or trigger inputs.

In test systems that incorporate instruments from several different manufacturers, the 2361 TCU can interface triggers with falling and rising edge directions to one another. Non-volatile program memory permits system synchronization without a GPIB controller.

ACCESSORIES AVAILABLE

8503   DIN-to-BNC Trigger Cable

SIGNALS

CONFIGURATION:
Six trigger inputs, TTL compatible.
Six trigger outputs, TTL compatible.
One 8-bit digital input port, TTL compatible.
One 8-bit digital output port, TTL compatible.

TRIGGER CHANNELS:
Input: May be programmed to detect rising or falling edges.
Output: Active low pulse, maximum pulse width 110us.

DIGITAL I/O:
Input: May be programmed to detect level or edges (either rising or falling).
Output: Specified level appears on digital output lines.

EXECUTION SPEED

INPUT PULSE WIDTH: 50ns minimum, unlimited maximum.

CHANNEL SYNCHRONIZATION (typical): Output pulses are synchronized to within 5ns.

TRIGGER PROPAGATION DELAY (IEEE-488 inactive): $350\mu s$ maximum, $100\mu s$ typical (T0D0, only one trigger I/0 relation evaluates true).

PULSE RECOGNITION RATE: 2kHz maximum at any trigger input.

RESPONSE TO IEEE-488 COMMAND:
Trigger Control Commands: 2.5ms maximum.
Trigger I/O Program: 25ms maximum.

IEEE-488 BUS IMPLEMENTATION

MULTIPLE COMMANDS: DCL, SDC, UNT, UNL, SPE, SPD.

UNILINE COMMANDS: IFC, REN, EOI, SRQ, ATN.

INTERFACE FUNCTIONS: SH1 AH1, T6, TE0, L4, LE0, SR1, RL2, PP0, DC1, DT0, C0, E1.

SRQ OPTIONS: SRQ on any of the following events: Trigger input detected, digital input detected, ready for IEEE-488 command, error.

PROGRAMMABLE FUNCTIONS: Trigger I/O programming, trigger I/O program initialization, trigger I/O program storage and retrieval, trigger input edge polarity, trigger response enable/disable, trigger latch initialization, trigger output generation, digital output specification, digital input edge polarity, SRQ masking, IEEE-488 holdoff, IEEE-488 output terminator, system status readback, factory default reset.

GENERAL

TRIGGER I/O PROGRAM: Up to six input-output relations constitute the program which resides in the internal memory. Non-volatile storage of up to three trigger I/O programs.

CONNECTORS:
Trigger Input, Output: Six BNC connectors each on rear panel.
Digital I/O: 20 pin card edge.

ENVIRONMENT: Operating: 0–50°C; 0–70% R.H.
Storage: –25 to 65°C.

POWER: 90–125 or 180–250V AC (internal switch selectable); 50–-60Hz. 10VA max.

DIMENSIONS, WEIGHT: 425mm wide × 45mm high × 309mm deep (16¾ in × 1¾ in × 12 in). Net weight 2.7kg (6.2 lb).