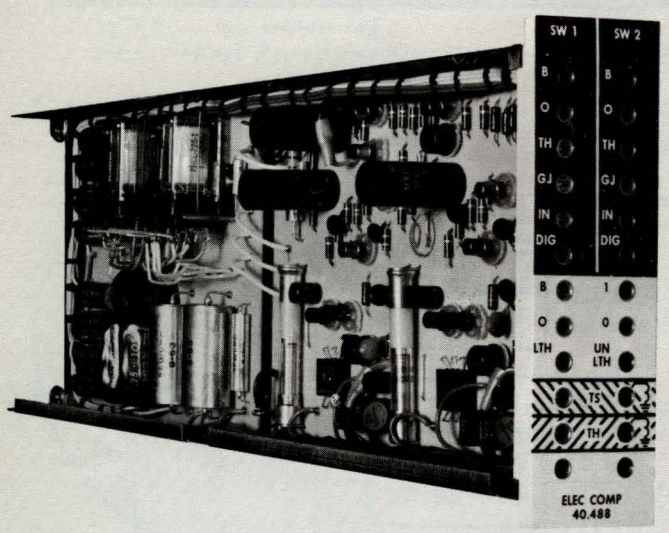
PIR

PRODUCT INFORMATION RELEASE

an accessory for PACE® TR-48 Analog Computers

ELECTRONIC COMPARATOR, model 40.488



FEATURES

- 5 microsecond typical switching time
- 1 millivolt sensitivity
- Plug-in, solid state, modular design
- Analog signal or external digital control
- Special "latch" "unlatch" inputs, simplifying complex operations
- Provides "track" and "hold" modes for repetitive and real time operation

The Electronic Comparator, Model 40.488 is a solid state signal comparator intended for use in the TR-48 Analog Computer. It is a single unit, performing the function of a form C relay, a mechanical relay comparator module and a repetitive operation display module. Control is by analog signals applied to its inputs, or by digital signals applied directly to the inputs of its two electronic switches. With appropriate patching and the addition of two external capacitors, two independent channels of track and storage (hold) may be provided.

(EAI RESERVES THE RIGHT TO REVISE ITS PRODUCT SPECIFICATIONS IN ACCORDANCE WITH ITS CONTINUING PROGRAM OF PRODUCT DEVELOPMENT.)

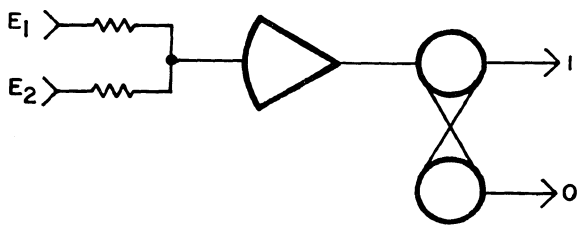
EAI® ELECTRONIC ASSOCIATES, INC. *West Long Branch, New Jersey*

TR-48
PIR 64051-1
July '64

Printed in USA

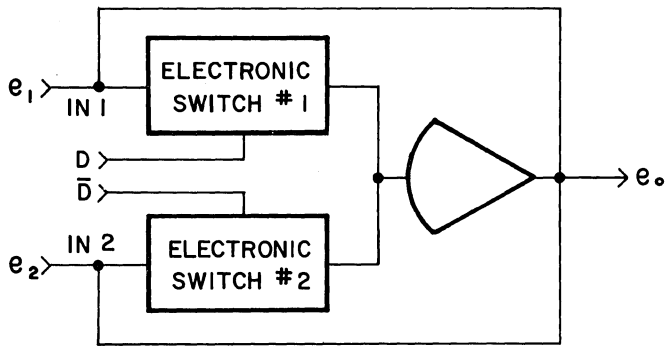
COMPARATOR

In the basic comparator, analog input control signals are applied to the two input terminals of a high gain d-c summing amplifier —— whose output signal in turn is used to set a flip-flop. With the sum of the amplifier input signals positive, the flip-flop is set with its 1 output at a binary One and its 0 output at a binary Zero. For a negative summation of the amplifier input signals, the flip-flop state is reversed.



ELECTRONIC SWITCH

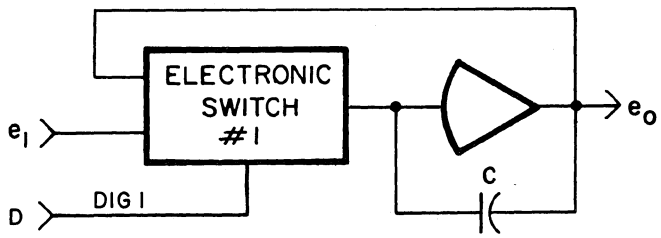
The flip-flop outputs or external digital signal levels may be used to control the two electronic switches in the unit —— as applied to the DIG terminals on the computer patch panel. Complementary control is obtained by applying complementary digital signal levels at the D and $\overline{D}$ inputs of the electronic switches. Signals to be switched, e, and e_2, are applied to the IN terminals of each electronic switch and the output e_0 is obtained at the terminal of an associated dc amplifier. With the level of binary One at input D and and the level of binary Zero at input $\overline{D}$, switch #1 is closed, switch #2 is open and the D-C amplifier output is $-e_1$. With the complementary control levels reversed the output is $-e_2$.

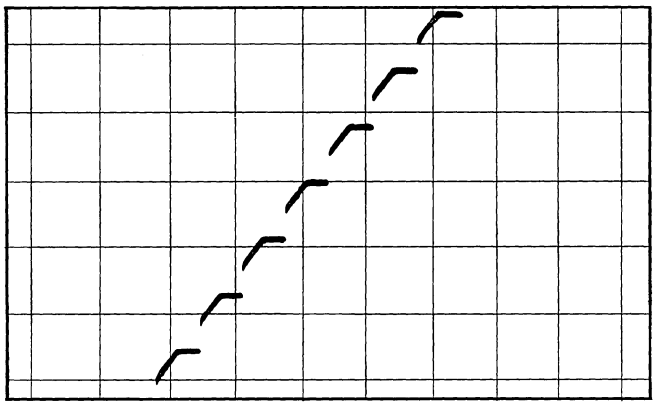


TRACK AND HOLD

The track and hold mode is an extension of the electronic switch section. A relay is energized by the bottle plug connection in the +H area, which connects 2K input and feedback resistors in the loop instead of the 10K resistors. A connection from +H to the amplifier output 0 provides the connection for the storage capacitor. When a +S bottle plug is installed, the circuit is prepared for repetitive operation.

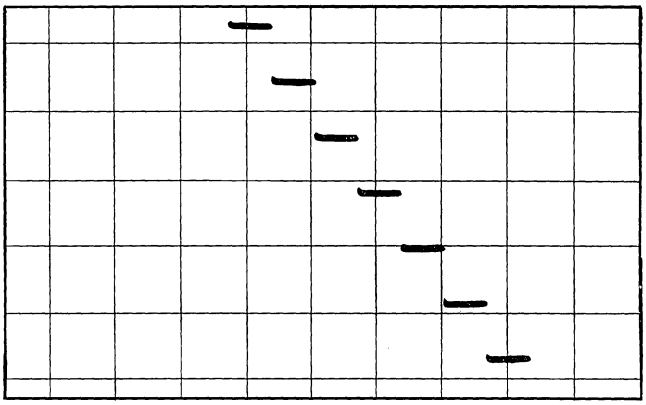
When D is a binary ONE the amplifier is in TRACK; similarly, when D is a binary ZERO the amplifier is in HOLD.





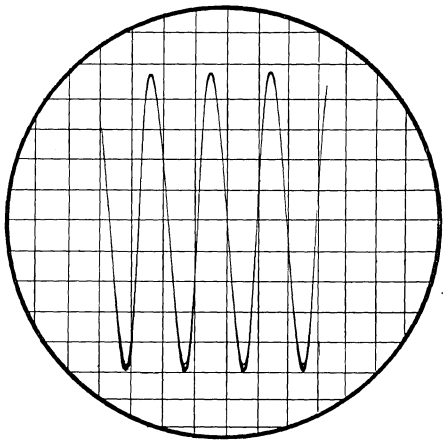
Output of 40.488 Used as Track. Hold Unit Sampling a Ramp at a 500 CPS Rate.

1/2V/CM — — Sensitivity (X)
1V/CM — — Sensitivity (Y)
Sweep Voltage Rep Op Sampling Rate — — 500 CPS



Output of Second Track-Hold Channel Which is Sampling Output of the First Track-Hold Channel (1) Controlled By Complementary Logic.

1/2V/CM — — Sensitivity (X)
1V/CM — — Sensitivity (Y)
Sweep Voltage Rep Op Sampling Rate — — 500 CPS



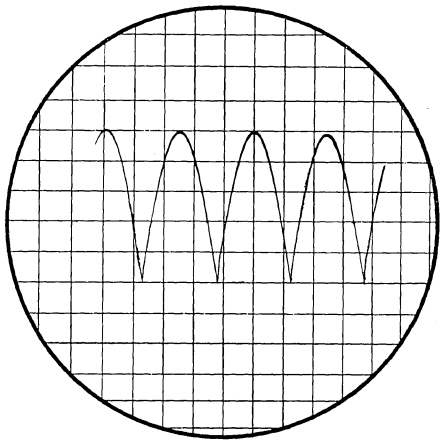
(Left) Output of 40.488 as Electronic Comparator Switching Between Same 1 KC Sinewave

2V/CM — — Sensitivity
.5 MS/CM — — Sweep 1 KC Sinewave

●

(Right) Output of 40.488 Switching Between 1 KC Sinewave and a 1 KC Cosewave

2V/CM — — Sensitivity
.2 MS/CM — — Sweep 1 KC Sinewave



SPECIFICATIONS

a. Power Supply Requirements

+15 VDC ..... @ 16 MA, Nominal
−15 VDC ..... @ 12 MA, Nominal
+10 VDC (Reference) ..... @ 2.0 MA
−20 VDC ..... Nominal, @ 80 MA

b. Basic Comparator

Switching Sensitivity ..... ±1.0 Millivolt, min.
Propagation Time (1), (2) .. 5.0 Microseconds, typ.
Analog Input Voltage Range .. −10 Volts to +10 Volts
Latch Input Impedance ..... 100 K Ohms, min.
Digital Output Levels:
Binary One ..... 5.0 VDC, Nominal
Binary Zero ..... 0.2 VDC, Nominal

c. Electronic Switch

Signal Input Impedance ..... 10 K Ohms
Propagation Time (2) ..... 1.0 Microsecond, typ.
DC Offset Voltage ..... ±500 Microvolts
Digital Control Input Levels:
Binary One ..... 5.0 VDC, Nominal
Binary Zero ..... 0.2 VDC, Nominal
Control Input Impedance ..... 100 K Ohms, min.

d. Track and Hold

Digital Control Input Levels:
Binary One ..... 5.0 VDC, Nominal
Binary Zero ..... 0.0 VDC, Nominal
Control Input Impedance ..... 100 K Ohms, min.
Signal Imput Impedance ..... 2K Ohms
Drift In Hold Mode:
Real Time Operation ..... 2.0 Millivolts/second
Fast Repetive Operation ..... 100 Microvolts/Millisecond
Phase Shift-Sinusoidal Input:
Real Time Operation .. 0.06° typ.,(20 VPP,10 cps)
Fast Repetitive Operation ..... 0.03° typ., (20 VPP, 1 kcps)
Gain Error — Sinusoidal Input:
Real Time Operation .. 0.02% typ.,(10 VPP,10 cps)
Fast Repetitive Operation ..... 0.1% typ., (10 VPP, 1 kcps)

NOTES:

(1) Basic comparator propagation time is dependent upon the slope of the algebraic sum of the input signals. The propagation time is 1 Microsecond typical for an input signal sum having a rise time of 5 Microseconds.

(2) The propagation time of the comparator and electronic switch in cascade is 5 Microseconds typical even though the propagation time of each is 5.0 and 1.0 microseconds respectively.

UNITED STATES and CANADIAN OPERATIONS

Marketing Division

SALES OFFICES

EASTERN UNITED STATES

Eastern Regional Office: West Long Branch, N.J., Tel: 201-229-1100, TWX 201-222-2795, Cable: PACE Long Branch, New Jersey
R & D and Special Product Sales: West Long Branch, N. J. Tel: 201-229-1100, TWX 201-222-2795, Cable: PACE Long Branch, N. J.
Parts Sales: West Long Branch, New Jersey, Telephone: 201-229-1100, TWX 201-222-2795, Cable: PACE Long Branch, N. J.
Northeastern District Office: 875 Providence Highway, Dedham, Massachusetts, Telephone: 617-326-6756
Southeastern District Office: 7902 Old Georgetown Road, Bethesda 14, Maryland, Telephone: 301-652-3625-3626
Cape Kennedy: 412 North Waterway Drive, Satellite Beach, Florida, Telephone: 305-262-1905

CENTRAL UNITED STATES

Central Regional Office: 325 West Prospect Avenue, Mount Prospect, Illinois, Telephone: 312-255-6070, TWX 312-392-1695

SOUTHWESTERN UNITED STATES

Southwestern United States: 3514 Cedar Springs Road, Room 211, Dallas, Texas, Telephone: 214-528-4920
Houston District Office: 7135 Office City Drive, Room 200, Houston, Texas, Telephone: 713-645-0544
Huntsville District Office: 215 Clinton Avenue W., Huntsville, Alabama, Telephone: 205-534-2429

WESTERN UNITED STATES

Western Regional Office: 1500 East Imperial Highway, El Segundo, California, Telephone: 213-322-3124, TWX 213-322-2144
San Francisco District Office: 4151 Middlefield Road, Palo Alto, California, Telephone: 415-321-0363

SERVICE ENGINEERING OFFICES

EASTERN UNITED STATES

Eastern U. S. Headquarters: West Long Branch, N. J., Tel: 201-229-1100, TWX 201-222-2795, Cable: PACE Long Branch, N. J.
Boston Area: 875 Providence Highway, Dedham, Massachusetts, Telephone: 617-326-6756
Washington D. C. Area: 7902 Old Georgetown Road, Bethesda 14, Maryland, Telephone: 301-652-3625-3626
Princeton, New Jersey: U. S. Route No. 1, Princeton, New Jersey, P. O. Box 582, Telephone: 609-924-2900
Resident Field Engineers: Bedford, Mass. / Florham Park, N.J. / Baltimore, Maryland / Kings Point, Long Island, New York Washington, D. C.

SOUTHEASTERN UNITED STATES

Huntsville, Alabama Area: 2113 Gladstone Drive, N. E., Huntsville, Alabama, Telephone: 205-536-7271

CENTRAL UNITED STATES

Central Regional Office: 325 West Prospect Avenue, Mount Prospect, Illinois, Telephone 312-255-6070, TWX 312-392-1695
Pittsburgh Area: 1749 McNary Boulevard, Pittsburgh 21, Pennsylvania, Telephone: 412-244-1661
Resident Field Engineers: Detroit, Michigan / Pittsburgh, Pennsylvania

SOUTHWESTERN UNITED STATES

Southwestern United States: 3514 Cedar Springs Road, Dallas, Texas, Telephone: 214-528-4920
Houston Area: 7135 Office City Drive, Houston, Texas, Telephone: 713-645-0544
Resident Field Engineers: San Antonio, Texas / Alamogordo, New Mexico

WESTERN UNITED STATES

Western U. S. Headquarters: CUSTOMER REPAIR FACILITY 310 East Imperial Highway, El Segundo, California, Telephone: 213-322-4166
Western U. S. Headquarters: SERVICE ENGINEERING FACILITY, 1500 East Imperial Highway, El Segundo, California, Telephone: 213-322-3124, Telex: 213-322-2144
Denver Area: 70 South Benton Drive, Denver, Colorado, Telephone: 303-233-0818
San Francisco Area: 4151 Middlefield Road, Palo Alto, California, Telephone: 415-321-0363
Resident Field Engineers: Edwards, California / Pasadena, California / Moffett Field, California

CANADA

Toronto Office: Mr. Allen Crawford Associates, Ltd., 4 Finch Avenue, West, Willowdale, Oontario, Canada, Tel: 416-225-7771

Research and Computation Division

Princeton Computation Center: U. S. Route No. 1, Princeton, New Jersey, P. O. Box 582, Telephone: 609-452-2900
EAI Computation Center at Los Angeles, Inc.: 1500 East Imperial Highway, El Segundo California, Telephone: 213-322-3220
Integrated Controls Department: 4151 Middlefield Road, Palo Alto, California, Telephone: 415-321-7801

Engineering and Manufacturing Division

Engineering Department: West Long Branch, New Jersey, Tel: 201-229-1100, TWX 201-222-2795, Cable: PACE Long Branch, N. J.
Manufacturing Department: West Long Branch, N.J., Tel: 201-229-1100, TWX 201-222-2795, Cable: PACE Long Branch, N. J.

INTERNATIONAL OPERATIONS

SALES OFFICES

ENGLAND

Electronic Associates, Ltd.: Burgess Hill, Sussex, England, Tel: Burgess Hill (Sussex) 5101-5, Telex: 87183, Cable: LONPACE

BELGIUM

EAI-European Continental Regional Office: Centre International, 22nd Floor, Place Rogier, Brussels 1, Belgium Telephone: Brussels 18-40-04, Telex: 2.21-106, Cable: PACEBELG Brussels

FRANCE

EAI-Electronic Associates SARL: 11 rue du Faubourg Poissonniere, Paris 9, France, Telephone: PRO 93-69

GERMANY

EAI-Electronic Associates GMBH: Martinstrasse, 14, Aachen, West Germany, Telephone: 26041

AUSTRALIA

EAI-Electronic Associates, Pty., Ltd.: 87 Alexander St., Crows Nest, N.S.W. Australia, Tel: 43-1557, Cable: PACEAUS, Sydney
34 Queens Road, Melbourne S.C. 2, Australia

SERVICE ENGINEERING OFFICES

EUROPEAN CONTINENT

EAI-Européan Continental Reg. Office: Centre International, 22nd Floor, Place Rogier, Brussels 1, Belgium, Telephone: Brussels 18-40-04, Telex: 2.21-106, Cable: PACEBELG Brussels

UNITED KINGDOM AND SCANDINAVIA

UK & Scandinavia: Electronic Associates, Ltd., Burgess Hill, Sussex, England, Tel: Burgess Hill (Sussex) 5101-5 Telex: 87183 Cable: LONPACE

ENGINEERING AND MANUFACTURING

Electronic Associates, Ltd.: Burgess Hill, Sussex, England, Tel: Burgess Hill (Sussex) 5101-5, Telex: 87183, Cable: LONPACE

COMPUTATION CENTERS

Brussels Computation Center: Centre International, 22nd Floor, Place Rogier, Brussels 1, Belgium, Tel: Brussels 18-40-04 Telex: 2.21-106, Cable: PACEBELG Brussels

United Kingdom Computation Center: Electronic Associates, Ltd., Burgess Hill, Sussex, England, Telephone: Burgess Hill (Sussex) 5101-5, Telex: 87183, Cable: LONPACE

EAI®

GENERAL OFFICES ■ *West Long Branch, New Jersey, U.S.A.*

ADVANCED SYSTEMS ANALYSIS AND COMPUTATION SERVICES/ANALOG COMPUTERS/DIGITAL COMPUTERS/HYBRID ANALOG-DIGITAL COMPUTATION EQUIPMENT/ANALOG AND DIGITAL PLOTTERS/SIMULATION SYSTEMS/SCIENTIFIC AND LABORATORY INSTRUMENTS/INDUSTRIAL PROCESS CONTROL SYSTEMS/PHOTOGRAMMETRIC EQUIPMENT/RANGE INSTRUMENTATION SYSTEMS/TEST AND CHECK-OUT SYSTEMS/MILITARY AND INDUSTRIAL RESEARCH AND DEVELOPMENT SERVICES/FIELD ENGINEERING AND EQUIPMENT MAINTENANCE SERVICES.