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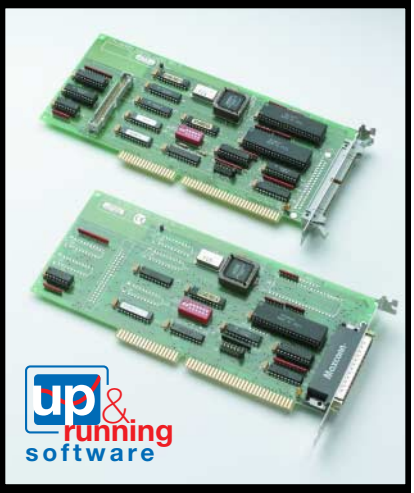
# CTM-05/A
# CTM-10

# 5/10-Channel 7MHz Counter/Timer Boards




- 5/10 independent 16-bit counters
- Uses industry standard 9513 chip
- CTM-05 compatible
- Counts frequency to 7MHz
- Up/down and binary/BCD counting
- Internal 1MHz/5MHz frequency source
- Programmed frequency output
- Complex pulse generation
- One-shot or continuous outputs
- Retriggering capability
- Programmable count/gate source selection
- Programmable input/output polarities
- AT and XT interrupts
- Programmable gating functions
- 8-bit or 16-bit latched input port
- 8-bit or 16-bit latched output port
- Interrupt input channel
- 32-bit DriverLINX drivers plus bundled start-up software. Compatible with TestPoint.

## Functional Description

Keithley's CTM-05/A and CTM-10 are 5 and 10 channel, respectively, counter/timer boards that plug into ISA-bus compatible PCs. You can use these boards in a broad range of applications, including position, time, frequency, and period measurements, output pulse train generation, event counting and gating, and frequency generation. The CTM-05/A and CTM-10 will operate in the fastest PC's including EISA and Pentium-based systems.

The CTM boards use the powerful 9513 counter/timer chip for event counting, pulse measurement, frequency measurement, and pulse generation. The CTM-05/A uses one 9513 which contains 5 general-purpose 16-bit counters. The CTM-10 contains two 9513's. An 8-bit digital input port and an 8-bit digital output port (16 bits on CTM-10) are also available as is an external interrupt (see block diagram).

Counter inputs are software-selectable as active-high or active-low. Each counter may be gated in hardware or by software. The counters can be programmed to count up or count down in either binary or BCD. All five counters can be connected together by software to form a 32-, 48-, 64-, or 80-bit counter.

Each counter has a Load Register and a Hold Register. The Load Register is used to automatically reload the counter to a programmed value, thus controlling the count and count period. The Hold Register is used to save count values without disturbing the counting process. This permits the PC to read intermediate counts. The Hold Register may also be used as a second Load Register to generate complex waveforms.

Each counter has a single dedicated output pin. It may be configured to be turned off when the output is not of interest. Considerable versatility is available for configuring both the input and the gating of individual counters. This permits dynamic reassignment of inputs under software control, allows multiple counters to use a single input, and allows a single gate pin to control more than one counter.

## Advanced Interrupt Capability

The interrupt source is software-selectable and can be set to any one of the five counter outputs or to an external interrupt input. The CTM-10 contains independent interrupt logic for both of its 5 channel halves. An interrupt is latched upon receipt of a rising edge (0 to 1 transition). The CTM-05/A and CTM-10 can be set via software to generate an interrupt on levels 3, 5, 7, 10, 11, or 15 of the host computer. For compatibility with existing applications, the CTM-05/A and the lower half of the CTM-10 also provides jumper-selectable interrupt levels of 2 through 7. Whenever any of the software-selectable interrupt levels are chosen, the jumper-selected interrupt feature is disabled.

## 9513 Counter/Timer Chip

The 9513 is an extremely powerful counter/timer chip. It supports 24 different modes of operation (A through X), some of which are listed below.

- Software (SW) triggered strobe without hardware gating
- Hardware (HW) triggered strobe
- Rate generator with or without HW gating
- Non-retriggerable or retriggerable one-shot
- SW-triggered delayed pulse one-shot with HW gate
- Variable duty cycle rate generator with or without gate
- Hardware-triggered delayed pulse one-shot
- SW-triggered strobe with edge gating and retriggering
- Rate generator with synchronization

### ACCESSORIES AVAILABLE (CTM-10)

| | |
|---|---|
| CAB-4037 | CTM-10 Aux. Connector to D37 Male Connector |
| CACC-2000 | CTM-10 to STA-50 Cable |
| STA-50 | Screw Terminal Accessory Board |
| STP-50 | Screw Terminal Panel for 50-pin cables |

### ACCESSORIES AVAILABLE (CTM-05/A and CTM-10)

| | |
|---|---|
| C1800 | CTM-05/A or CA4037 to STA-U or STP-37 Cable |
| MS-CTM-05/A | Upgrade to latest version of DriverLINX software and hardware manuals for CTM-05/A and -10 |
| STA-U | Universal Screw Terminal Accessory |
| STC-37 | Direct Screw Terminal Connector |
| STP-37 | Screw Terminal Panel for 37-pin cables |
| TESTPOINT | TestPoint Software Package |

Event counting, pulse measurement, frequency measurement, and more

PCI/ISA/PCMCIA

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Output pulse train generation, gating, frequency generation, and more

PCI/ISA/PCMCIA

# CTM-05/A CTM-10

# 5/10-Channel 7MHz Counter/Timer Boards

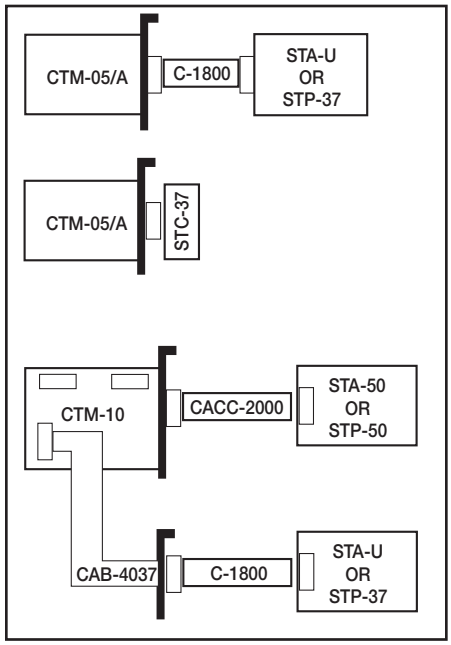
## Ordering Information

| | |
|---|---|
| CTM-05/A | 5-Channel Counter/ Timer Board |
| CTM-10 | 10-Channel Counter/ Timer Board |

## APPLICATIONS

- Event counting
- Frequency measurement
- Frequency synthesis
- Complex pulse generation
- Interval measurement

## Configuration Guide

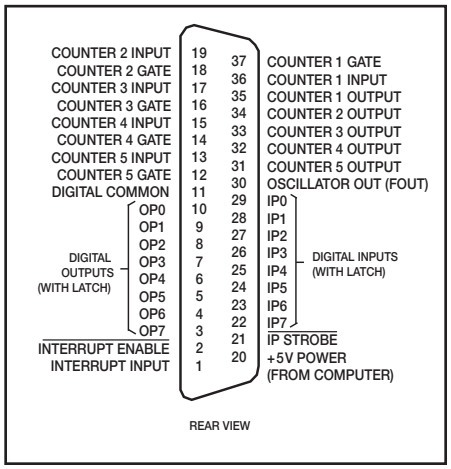



## Connector Pin Assignments

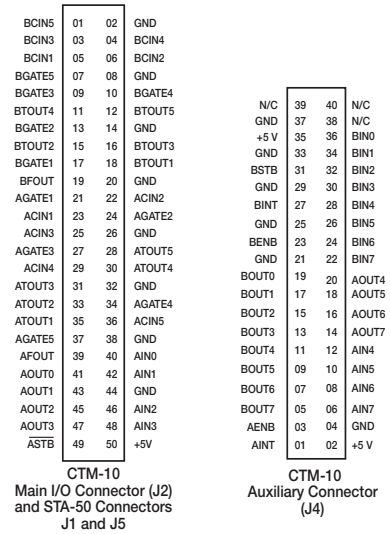
All counter and digital I/O for the CTM-05/A is accessed through a standard 37-pin D-type male connector that projects through the rear panel of the computer. For soldered connections, a standard 37-pin D-female (ITT/Canon DC37S or equivalent) is the correct mating part and can be ordered from Keithley as part number SFC-37. To simplify field wiring, use the STA-U Screw Terminal Board or STP-37 Screw Terminal Panel and the C1800 cable. Direct screw terminal connection is possible with the STC-37.

For the CTM-10, both Unit A and Unit B counters are provided on a standard 50-pin header. The digital I/O and the remaining (seldom used) control signals are provided on a standard 40-pin header. The CA4037 cable option can be used to bring these signals to a 37-pin D-male connector (requires second slot in PC).

## CTM-05/A Connector Pin Assignment




## CTM-10 Connector Pin Assignment




## Specifications

### COUNTER/TIMER

**TYPE OF COUNTER:** 9513 (2 in CTM-10).
**NUMBER OF COUNTERS:** 5 (10 in CTM-10).
**COUNTING MODES:** Up or down, binary or BCD.
**MAXIMUM INPUT RATE:** 7MHz.
**MINIMUM PULSE WIDTH: High:** 70ns. **Low:** 70ns.
**ONBOARD TIME BASE:** 1MHz or 5MHz, ±0.01% (0–70°C).
**INPUT LOW VOLTAGE:** 0.8V max.
**INPUT LOW CURRENT:** 1mA max.
**INPUT HIGH VOLTAGE:** 2.2V min.
**INPUT HIGH CURRENT:** –10μA max.
**OUTPUT LOW VOLTAGE:** 0.4V max at 3.2mA.
**OUTPUT HIGH VOLTAGE:** 2.4V min at –200μA.

### INTERRUPT INPUTS

| | CTM-05/A | CTM-10 |
|---|---|---|
| External Interrupts/Enable: | 1/1 | 2/2 |
| Interrupt Levels: (Jumper-Selectable): | 2 to 7 | same (lower 5 ch only) |
| (Software Selectable): | 3, 5, 7, 11, or 15 | same |
| Source Selection: | external signal or output 1, 2, 3, 4, or 5 | same |

### DIGITAL INPUTS

| | | |
|---|---|---|
| DIGITAL INPUTS (& INTERRUPTS): | LSTT | same |
| Input Bits: | 8 | 16 |
| Low Voltage: | 0.8V max | same |
| Low Current: | –0.4mA max | same |
| High Voltage: | 2.0V min | same |
| High Current: | 20μA max | same |

### DIGITAL OUTPUTS

| | | |
|---|---|---|
| Digital Outputs: | LSTTL | same |
| Output Bits: | 8 | 16 |
| Low Voltage: | 0.5V max at $I_{sink}$ = 8.0mA | |
| High Voltage: | 2.4V min at $I_{source}$ = –0.4mA | |

### ENVIRONMENTAL

**OPERATING TEMP:** 0 to +50°C.
**STORAGE TEMP:** –20 to +70°C.
**HUMIDITY:** 0 to 95% non-condensing.
**EMC:** Conforms to European Union Directive 89/336/EEC (CTM-05/A only).
**SAFETY:** Meets EN61010-1/IEC 1010 (CTM-05/A only).
**DIMENSIONS:** 9in × 4.5in × 0.75in (¾ slot); (22.9cm × 11.4cm × 1.9cm).
**WEIGHT:** 3.7oz (105g).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