

# SPECIFICATIONS

The following electrical specifications are valid for an ambient temperature range of -25 to +50°C unless otherwise specified.

## ANALOG INPUTS

NUMBER OF CHANNELS: 6 differential or up to 12 single-ended. Each differential channel can be configured as two single-ended channels.

CHANNEL EXPANSION: The Model AM416 Relay Multiplexer allows an additional 64 single-ended channels to multiplex into four CR10 single-ended channels. Up to three AM416's can be connected to one CR10.

ACCURACY OF VOLTAGE MEASUREMENTS AND ANALOG OUTPUT VOLTAGES:  
0.2% of FSR, 0.1% of FSR (0 to 40°C)

RANGE AND RESOLUTION: Ranges are software selectable for any channel. Resolution for a single-ended measurement is twice the value shown.

Full Scale Range	Resolution
± 2500 millivolts	333 microvolts
± 250 millivolts	33.3 microvolts
± 25 millivolts	3.33 microvolts
± 7.5 millivolts	1.00 microvolts
± 2.5 millivolts	0.33 microvolts

INPUT SAMPLE RATES: The fast A/D conversion uses a 0.25 ms signal integration time and the slow conversion uses a 2.72 ms signal integration. Two integrations, separated in time by 1/2 of an AC line cycle, are used with the 60 Hz or 50 Hz noise rejection option. Differential measurements include a second sampling with reversed input polarity to reduce thermal offset and common mode errors. Input sample rates are the time required to measure and convert the result to engineering units.

Fast single-ended voltage:	2.6 ms
Fast differential voltage:	4.2 ms
Slow single-ended voltage:	5.1 ms
Slow differential voltage:	9.2 ms
Differential with 60 Hz rejection:	25.9 ms
Fast differential thermocouple:	8.6 ms

INPUT NOISE VOLTAGE:

Fast differential	---	0.82 microvolts RMS
Slow differential	---	0.25 microvolts RMS
Differential with 60 Hz rejection	---	0.18 microvolts RMS

COMMON MODE RANGE: ± 2.5 volts.

DC COMMON MODE REJECTION: > 140 dB.

NORMAL MODE REJECTION: 70 dB  
(60 Hz with slow differential measurement).

INPUT CURRENT: 3 nanoamps maximum.

INPUT RESISTANCE: 200 gighoms.

## EXCITATION OUTPUTS

DESCRIPTION: The CR10 has 3 switched excitations, active only during measurement, with only one output active at any time. The off state is high impedance.

RANGE: ± 2.5 volts.

RESOLUTION: 0.67 millivolts.

ACCURACY: Same as voltage input.

OUTPUT CURRENT: 20 mA @ ± 2.5 V; 35 mA @ ± 2.0 V; 50 mA @ ± 1.5 V.

FREQUENCY SWEEP FUNCTION: A swept frequency, square wave output between 0 and 2.5 volts is provided for vibrating wire transducers. Timing and frequency range are specified by the instruction.

## RESISTANCE AND CONDUCTIVITY MEASUREMENTS

ACCURACY: 0.015% of full scale bridge output, limited by the matching bridge resistors. The excitation voltage should be programmed so the bridge output matches the full scale input voltage range.

MEASUREMENT TYPES: 6-wire and 4-wire full bridge, 4-wire, 3-wire, and 2-wire half bridge. Bridge measurements are ratiometric and dual polarity to eliminate thermal emf's. AC resistance measurements use a dual polarity 0.75 ms excitation pulse for ionic depolarization, with the signal integration occurring over the last 0.25 ms.

## PERIOD AVERAGING MEASUREMENTS

DEFINITION: The time period for a specified number of cycles of an input frequency is measured, then divided by the number of cycles to obtain the average period of a single cycle.

INPUTS: Any single-ended analog channel; signal dividing or AC coupling is normally required.

INPUT FREQUENCY RANGE:

Range Code	Preamp Gain	Input Hysteresis	Maximum Frequency
4	1	10 mV	200 kHz
3	10	1.0 mV	50 kHz
2	33	0.3 mV	20 kHz
1	100	0.1 mV	8 kHz

REFERENCE ACCURACY: ± 40 ppm.

RESOLUTION: ± 100 nanoseconds divided by the number of cycles measured. Resolution is reduced by signal noise and for signals with a slow transition through the zero voltage threshold.

TIME REQUIRED FOR MEASUREMENT: Signal period times the number of cycles measured plus 1.5 cycles.

## PULSE COUNTERS

NUMBER OF PULSE COUNTER CHANNELS: 2 eight bit or 1 sixteen bit; software selectable.

MAXIMUM COUNT RATE: 2000 Hz, eight bit counter; 250 kHz, sixteen bit counter. Pulse counter channels are scanned at 8 Hz.

MODES: Switch closure, high frequency pulse, and low level AC.

SWITCH CLOSURE MODE

Minimum Switch Closed Time: 5 milliseconds.  
Minimum Switch Open Time: 6 milliseconds.  
Maximum Bounce Time: 1 millisecond open without being counted.

HIGH FREQUENCY PULSE MODE

Minimum Pulse Width: 0.002 milliseconds.  
Maximum Input Frequency: 250 kHz.  
Voltage Thresholds: Count upon transition from below 1.5 V to above 3.5 V.  
Maximum Input Voltage: ± 20 V.

LOW LEVEL AC MODE

(Typical of magnetic pulse flow transducers or other low voltage, sine wave outputs).  
Minimum AC Input Voltage: 6 mV RMS.  
Input Hysteresis: 11 mV.  
Maximum AC Input Voltage: 20 V RMS.  
Frequency ranges on next column.

Frequency Range:	AC Input (RMS)	Range
	20 mV	1 Hz to 100 Hz
	50 mV	0.5 Hz to 400 Hz
	150 mV to 20 V	0.3 Hz to 1000 Hz

(Consult factory if higher frequencies are desired.)

## DIGITAL I/O PORTS

8 ports, software selectable as binary inputs or control outputs.

OUTPUT VOLTAGES (no load): high 5.0 V ± 0.1V; low < 0.1 V.

OUTPUT RESISTANCE: 500 Ω.

INPUT STATE: high 3.0 V to 5.5 V; low -0.5 V to 0.8 V.

INPUT RESISTANCE: 100 kΩ.

## TRANSIENT PROTECTION

All input and output connections to the CR10 module are protected using RC filters or transzorbis connected to a heavy copper bar between the circuit card and the case. The CR10WP Wiring Panel includes additional spark gap and transzorb protection.

## CPU AND INTERFACE

PROCESSOR: Hitachi 6303.

MEMORY: 32K ROM, 64K RAM.

DISPLAY: 8 digit LCD (0.5" digits).

PERIPHERAL INTERFACE: 9 pin D-type connector for keyboard display, storage module, modem, printer, cassette, and RS-232 adapter. Baud rates selectable at 300, 1200, 9600 and 76,800.

CLOCK ACCURACY: ± 1 minute per month.

MAXIMUM PROGRAM EXECUTION RATE: System tasks initiated in sync with real-time up to 64 Hz. One measurement with data transfer is possible at this rate without interruption.

## SYSTEM POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 volts.

TYPICAL CURRENT DRAIN: 0.5 mA quiescent, 13 mA during processing, and 35 mA during analog measurement.

BATTERIES: Any 12 volt battery can be connected as a primary power source. Enclosures with power supply options are available.

## PHYSICAL SPECIFICATIONS

SIZE: 7.8" x 3.5" x 1.5" - Measurement & Control Module; 9" x 3.5" x 2.9" - with CR10WP Wiring Panel. Additional room required for connectors.

WEIGHT: 2 lbs.

## WARRANTY

Two years against defects in materials and workmanship.



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