

# PROGRAMS CONTAINED IN THE STANDARD CR21 APPLICATIONS PROM

*The input and output processing capabilities of the CR21 are determined by the programs contained in the Applications Programmable Read Only Memory (PROM). The following is a brief description of the programs contained in the standard applications PROM (# 266).*

## INPUT PROGRAMS

PGM. NO.	DESCRIPTION	PGM. NO.	DESCRIPTION
1	Volt Range DC Input	7	101 Probe Temperature for -35 to +50 Deg. C range
2	Millivolt Range DC Input	8	201 Probe Relative Humidity with Compensation Temperature measured on Channel 4 only
3	Volt Range DC Input with 2 Volt DC Excitation	9	201 Probe Relative Humidity with Compensation Temperature measured on Channel 2, 3 or 4
4	Millivolt Range DC Input with 2 Volt DC Excitation	10	102 Probe Temperature for 5 to 95 Deg. C range
5	Volt Range with AC EXcitation and Demodulation on Channels 5, 6 and 7 for AC Resistance Measurements		
6	Pulse Counting for Channels 8 and 9		

## OUTPUT PROGRAMS

PGM. NO.	DESCRIPTION	PGM. NO.	DESCRIPTION
50	SAMPLE: Outputs the sensor reading taken at the end of the output interval.	63	output time. Normally used for station ID.
51	AVERAGE: Outputs the average of the sensor readings taken during the output interval.	63	TIME OF INPUT PORT CHANGE: Outputs the status and the time when an input port changes state.
52	TOTALIZE: Outputs the sum of the sensor readings taken during the output interval.	64	FAST OUTPUT (10, 20 or 30 Sec.): Used only with CR21's capable of 10 second input scan intervals to allow outputs more frequent than once per minute.
53	MAXIMIZE, TIME OF MAX: Outputs the highest sensor reading taken during the output interval and, optionally, the time of occurrence.	65	CONDITIONAL OUTPUT: Causes outputs from all remaining programs in a given output table to be generated at a faster (user entered) rate only when input port 1 is high.
54	MINIMIZE, TIME OF MIN: Outputs the lowest sensor reading taken during the output interval and, optionally, the time of occurrence.	66	INTERMEDIATE X - Y: Outputs the average of X - Y where X and Y are input channels. As an option, either X or Y can be an integer constant. If X - Y is negative, 0 is used for the value to be averaged. Also, the result of X - Y is left in channel 11†.
55	HISTOGRAM: Outputs the fraction of the output interval that the sensor reading was within each of a specified number of contiguous sub-ranges. An option allows weighting of each output by any reading from a second sensor which occurs when the range sensor is within the corresponding sub-range, e.g., wind direction histogram weighted by wind speed to obtain a wind rose.	67	INTERMEDIATE PORT STATUS: Outputs the fraction of the output interval that an input port was high. Also leaves a 1 (input port high) or 0 (input port low) in channel 10†.
56	WIND VECTOR: Uses data from a wind speed channel and a wind direction channel (0 to 360 deg.) to compute and output average wind speed, mean wind vector magnitude, mean wind vector direction, and standard deviation of direction.	68	INTERMEDIATE X * Y: Outputs the average of X times Y where X and Y are input channels. Also, leaves the result in channel 10†.
57	EVENT COUNTER: This is a conditional output for channel 8 or 9 that records the time and number of counts occurring over a user selected time interval. If no counts occur, no output is generated.	69	INTERMEDIATE X/Y: Outputs the average of X divided by Y where X and Y are input scan values. Also, leaves the result in channel 11†.
58 & 59	SET POINT CONTROLLER: Sets an output port high when the reading from a channel reaches or exceeds the user entered upper limit and resets it to a low state when the reading is below the user entered lower limit.	70	AVERAGE CUBED WIND: Outputs the average of the cube of the wind speed samples.
60	TIMED PORT TURN ON: Sets an output port high when the time until the next output is less than the user entered time interval. Generally used for sensor warm-up before sampling.	71	VAPOR PRESSURE/VAPOR PRESSURE DEFICIT: Outputs average vapor pressure and/or deficit in kilo pascals derived from instantaneously read values of air temperature and percent relative humidity.
61	STANDARD DEVIATION: Outputs the standard deviation of the sensor readings taken during the output interval.	72 & 73	GROWING DEGREE DAYS: Outputs growing degree days based on proportional contribution above a lower threshold and a fixed contribution above an upper threshold. Thresholds are user selected.
62	FIXED DATA: Outputs the user entered number at each	*D	MANUAL SCAN: Outputs a user entered ID number, time, and sampled data from the 7 analog channels upon keyboard command.

†Internal storage locations which can be viewed as input channels to be processed by subsequent output programs.

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## CR21 CASSETTE TAPE FORMAT OPTIONS

The CR21 and CR21L Microloggers write data to tape in either Format I or Format II. At time of purchase, it is **IMPERATIVE** that the user specify which format is desired.

*FORMAT I* data is written to tape in an ASCII format and up to 8,000 data points can be stored on one side of a 60 minute cassette tape. *FORMAT II* utilizes a BINARY format and up to 180,000 data points can be stored on one side of a 60 minute tape.

A cassette-computer interface is required for tape playback and transfer of data to a computer file. CSI currently produces the C20 Cassette Interface which is capable of reading either Format I or II. Moreover, the C20 uses a sophisticated error detection and correction technique while reading tapes generated in Format II. The old A235 Interface, which CSI no longer makes, will read Format I only. Thus, if users already have an A235 and want to purchase additional CR21's, they must specify the Format I tape option to maintain compatibility. Alternatively, A235 owners may elect to purchase a C20 and return the older version Format I CR21 dataloggers to the Factory for conversion to Format II at a nominal charge.

If no format option is specified, the user will automatically receive Format II.