

CR23X PROMPT SHEET

This prompt sheet is intended for field use or as a reference by those familiar with CR23X programming; additional details and examples are in the CR23X Operator's manual. Computer-assisted programming and communications are supported by Campbell Scientific's PC208W software.

*Modes

The CR23X can be interrogated or programmed via the built-in, 2-line Alphanumeric display. The **[*]** key is the most important because it controls access to each of the CR23X's 14 programming, data storage, and status areas ("star" modes). Once in a star mode, use **[A]** and **[B]** to move between entries. To enter a value, use the **[0]** through **[9]** keys, then press **[A]**. To exit a star mode, key in a different star mode. To exit all star modes and begin logging, key in **[*]** **[0]**.

[0] - **[9]** Key in data or instructions
[A] Enter (Advance)
[B] Back up

General Keystrokes
[C] Change value; Index a parameter; Change sign of a number
[D] Enter decimal point, or
[#] Clear digit just keyed
[D] Enter Help. Help is available when you see ? Use **[A]** to advance through help

[*] **[#]** **[0]** **0** **TURNS DISPLAY OFF (When in *0 mode)**
[*] **[0]** **0** **BEGIN LOGGING (compiles program and logs data)**

[*] **[1]** **1** **ENTER PROGRAM TABLE 1**
 01:xxxx Advance to a given Instruction location ("fast forward")
 01:x.xxxx Enter Execution Interval between 0.01 and 6553.5 s.
 Valid entries are multiples of 1/100 (0.01) s. 1/100 to 1 s.
 0.1 s. 1 to 6553.5 s.

01:Pxx Enter a Program Instruction (select appropriate instructions from the following pages). Entering an instruction number also loads blank entries for its associated parameters. For example, if Instruction 2 (differential volts) is desired, key in 2A which loads:
 01:P2
 01:00 Repts - repeats measurements on consecutive channels and places results in consecutive input locations
 02:00 Range - see option codes
 03:00 First differential channel to make measurement
 04:0000 First input location where measured result will be stored
 05:0.0000 Multiplier
 06:0.0000 Offset
 Key in values for each parameter then advance to 2nd instruction in program.

[*] **[2]** **2** **ENTER PROGRAM TABLE 2**
 Same structure as *1. Allows use of a different Execution Interval.

[*] **[3]** **3** **ENTER PROGRAM TABLE 3 (subroutines only)**
 Same structure as *1 except no Execution Interval

[*] **[4]** **4** **PARAMETER ENTRY TABLE - See CR23X manual.**

[*] **[5]** **5** **CLOCK (set or display CR23X time)**
 :HH:MM:SS (displays current datalogger time)
 05:xxxx Year
 05:xxxx Julian Day of Year (1 of 2 Formats allowed):
 Day of Year XXX (1-366) (Calendar on back)
 MMDD (e.g., 1012 for October 12th)
 05:HHMM Hours Minutes

[*] **[6]** **6** **INPUT STORAGE (display data values, flags, or port status. Compile program without resetting input storage, flags or ports)**
 06:xxxx Advance to a given Input Storage Location

*6 Commands
[#] Display Input Location Number or enter location to advance to
[C] Enter value in Input Location; change sign
[D] Display Flags 1-8, toggle flag w/keys 1-8
[1] Display Flags 11-18, toggle flag w/keys 1-8
[0] Display Ports 8-1, toggle port w/keys 1-8

[*] **[7]** **7** **FINAL STORAGE (display values stored in area 1 or 2)**
 07:xx Select area 1 or 2 (skipped if 2 not allocated)
 07:xxxxx DSP location; enter location to advance to

*7 Commands
[#] Display Final Storage location No.; enter location to advance to, or C to display data
[#] **[A]** Advance to same element in next array w/ same ID
[#] **[B]** Back up to same element in previous array w/ same ID

[*] **[8]** **8** **MANUAL DATA DUMP**
 08:xx Select Storage Area 1 or 2 (skipped if 2 not allocated)
 01:xx Output Device/Baud Code (see Inst. 96 options)
 02:xxxxx Current or start Final Storage Location
 03:xxxxx DSP or end Final Storage Location
 04:xx Enter any number to start dump
 # Aborts dump

[*] **[9]** **9** **STORAGE MODULE COMMANDS - See Storage Module manual**

[*] **[A]** **A** **MEMORY ALLOCATIONS (display or change)**

01:xxxx Input Storage Locations
 02:xxxx Intermediate Storage Locations
 03:x Final Storage Locations - Area 2
 04:xxxxx Final Storage Locations - Area 1
 05:xxxx.x Memory allocated for program (bytes)
 06:xxxx.x Remaining program memory (bytes)
 07: Program bytes Available
 08: Label bytes used
 09: Label bytes free

[*] **[B]** **B** **STATUS/ON-BOARD FIRMWARE**
 01:xxxx Program signature
 02:xxxx Operating System signature
 03:xxxx K bytes memory: Flash + SRAM
 04:xx No. of Watchdog (E08) Errors (Key 88 to reset)
 05:xx No. of Skipped Scans Errors (Key 88 to reset)
 06:x.xxxx Operating System Version number
 07:xxxx Operating System Revision number
 08:x.xxxx Lithium battery voltage
 09:xx Low 12 V batt. detect counter (Key 88 to reset)
 10:xx Flash memory error counter (Key 88 to reset)
 11:x.xxxx Flash memory time to erase, seconds
 12:xx No. of Low 5 V Errors (Key 88 to reset)
 13:x.xxxx Execution time of Table 1
 14:x.xxxx Panel Temperature in °C
 15:xx Co-processor revision
 16:xx Co-processor status
 17:xx CPLD revision

[*] **[C]** **C** **SECURITY (display or change)**
 01:xxxx Lock *1, *2, *3, *A, *D
 02:xxxx Lock *4, *5 & *6 except display
 03:xxxx Lock *5, *6, *7, *8, *9, *B; telecommunication commands except A, L, N, and E

[*] **[D]** **D** **STORE OR LOAD PROGRAMS**
 1 Print program (ASCII)
 2 Load program (ASCII), *0 compile
 2 Load program (ASCII), *6 compile
 6 Store program in Flash
 7 Load program from Flash
 7N Store/Load/Clear program in Storage Module N (N = 1-8)
 1x Store program x in Storage Module N
 2x Load program x from Storage Module N
 3x Clear program x from Storage Module N
 x = program 1-8
 8 Set Datalogger ID
 9 Set Full/Half Duplex
 10 Set Power-Up Options
 0 Clear ports, flags, timer, and input and intermediate storage
 1 Clear intermediate storage
 2 Retain ports, flags, timer and input and intermediate storage
 3 Do not change power-up settings
 11 Set Display's Contrast Level
 A - Darken from present settings
 B - Lighten from present settings
 11 -- Stop Program
 12 Set Initial Baud/Set RS-232 Power
 13 Set Compile Option

CR23X INSTRUCTIONS AND PARAMETERS

INPUT/OUTPUT INSTRUCTIONS

INST.	01:	02:	03:	04:	05:	06:	07:	08:	09:	10:	11:	12:	13:	14:	
1	VOLT (SE)	REPS	RANGE†	SE CHAN	LOC	MULT	OFFSET								
2	VOLT (DIFF)	REPS	RANGE†	DIFF CHAN	LOC	MULT	OFFSET								
3	PULSE	REPS	CHAN/PORT	CONFIG†	LOC	MULT	OFFSET								
4	EX-DEL-SE	REPS	RANGE†	SE CHAN	EX. CHAN†	DELAY 0.01s	EXCIT mV	LOC	MULT	OFFSET					
5	AC HALF BR.	REPS	RANGE†	SE CHAN	EX. CHAN†	EXCIT mV	LOC	MULT	OFFSET						
6	FULL BR.	REPS	RANGE†	DIFF CHAN	EX. CHAN†	EXCIT mV	LOC	MULT	OFFSET						
7	3W HALF BR.	REPS	RANGE†	SE CHAN	EX. CHAN†	EXCIT mV	LOC	MULT	OFFSET						
8	EX-DEL-DIFF	REPS	RANGE†	DIFF CHAN	EX. CHAN†	DELAY 0.01s	EXCIT mV	LOC	MULT	OFFSET					
9	FULL BR. w/M. EX.	REPS	EX. RANGE†	BR. RANGE†	DIFF CHAN	EX. CHAN†	EXCIT mV	LOC	MULT	OFFSET					
10	BATT VOLT	LOC													
11	TEMP-(107)	REPS	SE CHAN	EX./INTG†	LOC	MULT	OFFSET								
12	R.H. (207)	REPS	SE CHAN	EX. CHAN†	TEMP LOC	R.H. LOC	MULT	OFFSET							
13	TC TEMP (SE)	REPS	RANGE†	CHAN/LOC†	TC TYPE†	REF. LOC	LOC	MULT	OFFSET						
14	TC TEMP (DIFF)	REPS	RANGE†	CHAN/LOC†	TC TYPE†	REF. LOC	LOC	MULT	OFFSET						
15	PORT SERIAL I/O	REPS	OPTION†	CTS/DELAY	PORT	OUT LOC	NO. LOC	TERM CHAR	MAX	INPUT DELAYLOC	MULT	OFFSET			
16	RTD TEMP	REPS	R/Ro LOC	LOC	MULT	OFFSET									
17	PANEL TEMP	LOC													
18	TIME	OPTION†	MOD/BY	LOC											
19	SIGNATURE	LOC													
20	SET PORT(S)	8765†	4321†												
21	PORT w/DURATION	PORT	LOC												
22	DELAY w/OPT EX	EX.CHAN†	DEL w/ex.	DEL after ex.	EXCIT mV†										
23	BURST MODE	NO. CHAN	RANGE†	IN CHAN	OPTION†	SCAN (ms)	SCANS (103)	SMPL Before	TR. LIM.	EXCIT	LOC	MULT	OFFSET		
24	CALIBRATION	OPTION†	LOC												
25	READ PORTS	MASK†	LOC												
26	TIMER	LOC (0 resets timer)													
27	PERIOD AVG (SE)	REPS	OPTION†	SE CHAN	NO. CYC.	LIM 0.01 s	LOC	MULT	OFFSET						
28	VIB. WIRE (SE)	REPS†	SE CHAN	EX CHAN	START F.†	END F.†	NO. CYC.	DEL 0.01s	LOC	MULT	OFFSET				
29	PS9105E INW	DIFF CHAN	EX. CHAN	LOC	PSIG	Enhanced Parameters (CSI parameters 4-23)†									
100	SDM-TDR	ADDR	OPTION†	PROBE (m)	CABLE (m)	MMMP	LOC	MULT	OFFSET						
101	SDM-INT8	ADDR	C:8765†	C:4321†	F:8765†	F:4321†	AVG. OPT.†	LOC	MULT	OFFSET					
102	SDM-SW8A	REPS	ADDR	FUNC†	CHAN	LOC	MULT	OFFSET							
103	SDM-AO4	REPS	ADDR	LOC											
104	SDM-CD16AC	REPS	ADDR	LOC											
105	SDI-12 RECORDER	ADDR	CMD†	PORT	LOC	MULT	OFFSET								
106	SDI-12 SENSOR	ADDR	TIME/VAL†	LOC											
107	SDM CSAT3	REPS	ADDR	OPTION†	LOC										
108	SDM-UDG01	ADDR	TEMP LOC	LOC	MULT	OFFSET									
109	SDMX50	ADDR	CHAN												
110	SDM GROUP TRIGGER														
113	SDM-SIO4	REPS	ADDR	MODE†	COMMAND	1ST PAR	2ND PAR	VALUES/REP	LOC	MULT	OFFSET				
114	SET TIME	OPTION†	LOC												
115	SDM BAUD	BIT PERIOD	10 µs												
117	DATALOGGER ID	ID LOC													
130	STATUS MONITOR	OPTION†	LOC												
131	EXT. VIB. WIRE (SE)	REPS†	OPTION	SE CHAN	EX CHAN	START F.†	END F.†	SWEEP†	STEPS	DEL 0.01S	NO.CYC	DEL/REP	LOC	MULT	OFFSET
132	SETTLING TIME	Milliseconds													
133	CAO ANALOG OUT	CAO CHAN†	LOC												
134	AM25T	REPS	RANGE	AM25T CHAN	DIFF CHAN	EX CHAN	PORT	RST PORT	TC TYPE†	REF LOC	LOC	MULT	OFFSET		

†Option Codes

1-14 RANGE codes:

Fast (250 µs integration time)			
60 Hz Rejection			
50 Hz Rejection			
Full scale range			
11	21	31	± 10 mV
12	22	32	± 50 mV
13	23	33	± 200 mV
14	24	34	± 1000 mV
15	25	35	± 5000 mV

3 CONFIGURATION codes:

- To record all counts:
 - 0 High frequency (-- for 100 Hz reset)
 - 1 Low level AC (-- for 100 Hz reset)
 - 2 Switch Closure
 - 3 High frequency, 16 bit
 - 4 Low level AC, 16 bit
- Discard counts beyond execution interval
 - 1x (x = 0-4 from above)
- Discard counts, output frequency (Hz)
 - 2x (x = 0-4 from above)

4-10,12 EXCITation CHANnel codes:

- 0x Excite all reps with EX CHAN x
- 1x Increment EX CHAN x with each rep

11 EXCITation/INTEGRATION codes:

- 0x Excite all reps with channel x
- 1x Increment chan x with each rep
- 2x Excite all reps with channel x, 60 Hz rej (16.67 ms)
- 3x Excite all reps with channel x, 50 Hz rej (20 ms)
- 4x Increment chan x with each rep, 60 Hz rej (16.67 ms)
- 5x Increment chan x with each rep, 50 Hz rej (20 ms)

13,14 CHANnel/LOCation:

If channel is indexed, parameter 3 becomes an input location holding a voltage measurement.

13, 14, 134 ThermoCouple TYPE codes:

- x1 T (copper-constantan)
- x2 E (chromel-constantan)
- x3 K (chromel-alumel)
- x4 J (iron-constantan)
- x5 B (platinum-rhodium)
- x6 R (platinum-rhodium)
- x7 S (platinum-rhodium)
- x8 N (nickel-chromium)
- x = 0 Normal Measurement
- x = 8 TC input from A5B40 isolation
- x = 9 Output -99999 if out of common mode range (Inst. 14 only)

15 OPTION:

ASCII	Hex Pair	Binary	Logic Level/Baud
00	10	20	TTL, 1200 baud
01	11	21	RS-232, 1200 baud
02	12	22	TTL, 300 baud
03	13	23	RS-232, 300 baud

18 OPTION codes:

- 0 seconds into minute (max 60)
- 1 minutes into day (max 1440)
- 2 hours into year (max 8784)
- 3 store year, day, hour, minute, second into 5 input locations

20 8765, 4321 Each digit configures respective port

- 0 Set Low
 - 1 Set High
 - 2 Toggle
 - 3 1 ms Pulse
 - 4 10 ms Pulse
 - 5 100 ms Pulse
 - 6 1 s Pulse
 - 7 Configure as output
 - 8 Configure as input
 - 9 No change
- } Sets duration for subsequent Pulse Port Command.

22 Excitation CHANnel/EXCITation mV:

If excitation channel is indexed, parameter 4 becomes the input location from which to get the excitation voltage.

23 RANGE codes: (250 µs integration time)

Fast		Full scale range	
13	±	200	mV
14	±	1000	mV
15	±	5000	mV

23 OPTION code, 4 digits:

- A** Trigger
 - 0 -- Trigger on 1st analog channel
 - 1 -- Digital trigger on C1
 - 2 -- Same as 0, but sets C1 high during measurements
- B** Trigger option
 - 0 -- Trigger immediately
 - 1 -- Trigger if above limit (high)
 - 2 -- Trigger if below limit (low)
 - 3 -- Trigger on rising edge
 - 4 -- Trigger on falling edge
- C** Destination
 - 0 -- To input loc storage
 - 1 -- CS I/O, 9600 baud
 - 2 -- CS I/O, 76800 baud
 - 3 -- Serial port, 76800 baud to Storage Module
 - 5 -- CS I/O 38400 baud
 - 6 -- RS232 38400 baud
- D** Measurement
 - 0 -- Differential measurement
 - 1 -- Single-ended measurement

24 OPTION:

- 0 Calibration only the Active Components; Don't store the results
- 1 Calibration only the Active Components; Store the Active Components
- 2 Calibration All Components; Store the results
- 3 Do Not Calibrate; Store Active Components

25 MASK:

Base 2 representation of ports 8-1; 1 means read, 0 means don't read. Entered as base 10 (0-255). Results are stored as base 2 converted to base 10. 1 indicates high, 0 indicates low or not read.

27 OPTION codes:

Code	Peak-to-Peak Volts	Max. Freq.
x1	2.0 mV	10 kHz
x2	5.0 mV	20 kHz
x3	10 mV	30 kHz
x4	500 mV	200 kHz
x = 0	Output period in microseconds	
x = 1	Output frequency in kHz	

28 REPS: Hit C (-) to skip repeat of excit.

START Frequency of sweep (100's of Hz)
END Frequency of sweep (100's of Hz)

29 Enhanced Parameters

These parameters are listed on the manufacturer's calibration sheet, where:

CSI Par.	Enhanced parameters
04:	1
05:	2
06:	3
.	.
.	.
.	.
23:	20

100 OPTION, 4 digits:

- 0 La/L for PB30
- 1 Waveform
- 2 Waveform + Derivative
- 3 Electrical Conductivity
- 4xxx LA/L + Correction (in mm)
- 98 Manual Step
- 99 PROM Signatures

101 C:8765, C:4321 Each digit Configures respective channel

- 0 High level, rising edge
- 1 High level, falling edge
- 2 Low level ac, rising edge
- 3 Low level ac, falling edge

101 F:8765, F:4321 Each digit sets Function for respective channel

- 0 No value returned
- 1 Period, ms
- 2 Frequency, kHz
- 3 Time since previous channel, ms
- 4 Time since channel 1, ms
- 5 Counts on 2 since 1, interpolated
- 6 Low resolution frequency, kHz
- 7 Counts
- 8 Integral counts on 2 since 1

101 AVeraging OPTION

- 0 Execution interval averaging
- 0-- Continuous averaging
- xxxx Specify average interval in ms
- xxxx-- Capture all events until xxxx edges of channel 1
- 9999-- Test Memory

102 FUNCTION

- 0 Channel state
- 1 Duty cycle
- 2 Counts
- 3 Memory test

105 SDI-12 CoMmanD codes:

Entry	Command	Description
0	M	Initiate measurement
0--	C	Initiate concurrent measurement
1..9	M1..M9	Additional measurement commands specified by the SDI-12 sensor
10	V	Initiate verify sequence
11	I	Send identification

106 TIME/VALues codes:

tttn: t t t = time (seconds)
n = No. values

107 OPTION codes:

- 0, 90, 91, 92 Trigger now & get data
- 97, 98, 99 Get data after group trigger
- 1..3, 5, 6, 10, 12, 15, 20, 30, 60 Execution Parameter

113 MODE

- 1 - Send/ Receive Port 1
- 2 - Send/ Receive Port 2
- 3 - Send/ Receive Port 3
- 4 - Send/ Receive Port 4
- 5 - Send/Receive All 4 Ports

114 OPTION codes:

- 0 - Set time with hr, min, sec values from 3 input locations
- 1 - Set time with day, hr, min, sec values from 4 input locations
- 2 - Set time with yr, day , hr, min, sec from 5 input locations

130 OPTION codes:

- 0 - Watchdog Error (E08)
- 1 - Table overruns
- 2 - Low 12 V Counts
- 3 - Lithium Battery Voltage
- 4 - Flash Errors
- 5 - 5 V Error Counter
- 6 - Program time of Table 1
- 7 - Time required of previous instruction
- 8 - Internal Panel Temperature from *B

131 OPTION

Code	Max Freq.
1	10 kHz @ 2 mV peak-to-peak
2	20 kHz @ 5 mV peak-to-peak
3	30 kHz @ 10 V peak-to-peak
4	200 kHz @ 500 V peak-to-peak

133 CAO CHANnel:

- 01 - CAO1
- 02 - CAO2
- 11 - CAO1 w/Boost or High Power Mode
- 12 - CAO2 w/Boost or High Power Mode

PROCESSING INSTRUCTIONS

INST.		01:	02:	03:	INST.	01:	02:	03:	04:	05:	06:	07:	08:	09:	10:	11:	12:	
30	Z=F*10 EXP	F	EXP	Z	49	SPA. MAX	SWATH	1ST LOC	MAX LOC†									
31	Z=X	X	Z		50	SPA. MIN	SWATH	1ST LOC	MIN LOC†									
32	Z=Z+1	Z			51	SPA. AVG	SWATH	1ST LOC	AVG LOC									
33	Z=X+Y	X	Y	Z	52	RUNNING AVG	REPS	SRCE LOC	DEST LOC	# IN AVG								
34	Z=X+F	X	F	Z	53	A * X+B	START LOC	A1	B1	A2	B2	A3	B3	A4	B4			
35	Z=X-Y	X	Y	Z	54	BLOCK MOVE	NO. VALS	SRCE LOC	S.STEP	DEST LOC	D.STEP							
36	Z=X * Y	X	Y	Z	55	POLYNOMIAL	REPS	X LOC	F(X) LOC	C0	C1	C2	C3	C4	C5			
37	Z=X * F	X	F	Z	56	SAT. VP	TEMP LOC	LOC										
38	Z=X/Y	X	Y	Z	57	WB/DBT to VP	PRESSURE	DB TEMP	WB TEMP	LOC								
39	Z=SQRT(X)	X	Z		58	LP FILTER	REPS	X	F (X)	WGHT.F.								
40	Z=LN(X)	X	Z		59	RF (X/1-X)	REPS	X	MULT (RF)									
41	Z=EXP(X)	X	Z		60	FFT	LOG2 (SMPL)	OPTION†	LOG2 (AVG)	LOC	MULT							
42	Z=1/X	X	Z		61	INDIR MOVE	SRCE LOC	DEST LOC										
43	Z=ABS(X)	X	Z		62	COV/CORR	VALUES	MEANS	VAR	S.DEV	COV	CORRS	SAMPLES	SRCE LOC	DEST LOC			
44	Z=FRAC(X)	X	Z		63	EXT PAR 2 DIGIT	†(8 parameters, depends on the inst. that 63 follows)											
45	Z=INT(X)	X	Z		64	PAROSCIENTIFIC	SRCE LOC†	DEST LOC†										
46	Z=X MOD F	X	F	Z	65	BULK LOAD	F	F	F	F	F	F	F	F	F	F	LOC	
47	Z=X^Y	X	Y	Z	66	Z=ARCTAN(X/Y)	X	Y	Z									
48	Z=SIN(X)	X	Z		67	DYNAGAGE	SRCE LOC	KSH	HEATER RF AREA	CONDUCT	TC GAP	LF CUTOFF	HF CUTOFF	OUTPUT†	DEST LOC	MULT	OFFSET	
					68	EXT PAR 4 DIGIT	†(8 parameters, depends on the inst. that 68 follows)											

†Option Codes

<p>49, 50 MAX/MIN: 0xxx Store spatial max or min at loc xxx in help 1xxx Store max or min at loc xxx & loc of max or min at xxx+1</p> <p>60 OPTION codes: 0x Power spectra 1x Real and imaginary 2x Magnitude and phase x = 0 No taper x = 1 Taper</p>	<p>63, 68 PARAMETERS 1-8: Following Inst. 97 RF IDs & Phone No.: 1 digit at a time 32 Between RF IDs (e.g. repeater & site) 32 & 84 Between RF & phone modem No. 70 After last RF 13 To end Following Inst. 98 (256 character limit) Base 10 value of ASCII Character (1-99) 00 to end</p>	<p>64 VALUES LOC: Start Loc: U(t), Tau, U0..T5</p> <p>64 DESTINATION LOCATION: Start Loc: Temp (°C), pressure (psi), Signature</p> <p>67 OUTPUT codes: 0 Short (sap flow, Kshapp) 1 Long (sap flow, Kshapp, dT, W, Qv, Qr, Qf)</p>
---	---	---

OUTPUT PROCESSING INSTRUCTIONS

INST.		01:	02:	03:	04:	05:	06:	07:	08:	09:	10:
69	WIND VECTOR	REPS	SAMPLE/SUB†	SEN/OUT†	WS/E	WD/N					
70	SAMPLE	REPS	LOC								
71	AVERAGE	REPS	LOC								
72	TOTAL	REPS	LOC								
73	MAXIMUM	REPS	TIME†	LOC							
74	MINIMUM	REPS	TIME†	LOC							
75	HISTOGRAM	REPS	BINS	FORM†	SRCE LOC	WV LOC†	LOW LIM	HIGH LIM			
77	REAL TIME	OPTION†									
78	RESOLUTION	OPTION†									
79	SMPL ON MAX/MIN	REPS	LOC	(must follow Inst. 73 or 74)							
80	STORE AREA	AREA†	LOC/ID								
81	RAIN HISTOGRAM	REPS	SRCE LOC	SWATH	MEAN BINS	AMP BINS	LOW LIM	HIGH LIM	MIN AMP	OPTION†	DEST LOC†
82	STD DEV	REPS	LOC								

†Option Codes

<p>69 SAMPLE/SUBinterval (std dev): 0 No subinterval xxxx Number of scans per subinterval</p> <p>SENSOR type/OUTPUT codes: x0 Avg WS, θ_1, $\sigma(\theta_1)$ x1 Avg WS, θ_1 x2 Avg WS, resultant U, θ_u, $\sigma(\theta_u)$ x = 0 (anemometers & vanes) x = 1 (north- & east-facing propellers)</p> <p>Where: θ_1 = Avg unit vector dir $\sigma(\theta_1)$ = Std dev dir (Yamartino) θ_u = Avg resultant vector dir $\sigma(\theta_u)$ = Std dev dir (CSI)</p>	<p>73,74 TIME of max or min: 00 Max/min value only 01 With seconds 10 With Hour-Minute 11 With Hour-Minute, Second</p> <p>75 FORM codes: 0 Open form (data beyond limits are included) 1 Closed form (data beyond limits are excluded)</p> <p>WV LOCATION: 0 Frequency Distribution xxxx Weighted Value Loc</p>	<p>77 OPTION codes: xxx1 Seconds xx1x Hour-Minute xx2x Hour-Minute, 2400 at midnight x1xx Day x2xx Day, Previous day at midnight 1xxx Year (0 - no output, e.g., 110 = Day, Hr-Min)</p> <p>78 OPTION codes: 0 Low resolution 1 High resolution</p>	<p>80 DATA AREA codes: 1 Final Storage 1 2 Final Storage 2 3 Input Storage</p> <p>81 OPTION: 00 Closed form/Fraction output 01 Closed form/Counts output 10 Open form/Fraction output 11 Open form/Counts output</p> <p>DESTINATION LOCATION: 0 Send directly to Final Storage xxxx First input location to store histogram</p>
---	--	---	---

PROGRAM CONTROL INSTRUCTIONS

INST.		01:	02:	03:	04:	05:	06:	07:	08:	09:	10:	11:	12:							
83	IF CASE < F	F	CMD†																	
85	BEGIN SUBR	SUBR†																		
86	DO	CMD†																		
87	BEGIN LOOP	DELAY	COUNT																	
88	IF X <=> Y	X	COMP†	Y	CMD†															
89	IF X <=> F	X	COMP†	F	CMD†															
90	LOOP INDEX	STEP																		
91	IF FLAG/PORT	COMP†	CMD†																	
92	IF TIME IS	T†	INT†	CMD†																
93	BEGIN CASE	CASE LOC																		
94	ELSE																			
95	END																			
96	SERIAL OUT	DEVICE†																		
97	INITIATE TELE.	MODEM†	FLAG	LIM(sec)	F.DEL(sec)	NO. RETRIES	S.DEL (min)	FAIL LOC	ID (must be followed by Inst. 63 or 68)											
98	SEND CHAR	DEVICE†	(must be followed by Inst. 63 or 68)																	
111	RUN FLASH	F. PROGRAM	(indexing compiles program as *6)																	
120	TGT1 GOES	BUFFER†	FWD/REF LOC																	
121	ARGOS	COMMAND	COMMAND	COMMAND																
122	INMARSAT-C	OPTION†	DNID	LES																
123	AUTO PROG TGT1	1-8: ADDR, 9: ASSIGNED CH, 10: RANDOM CH, 11: TIMED DAYS, 12: TIMED HRS, 13: TIMED MIN, 14: TIMED SEC, 15: RANDOM HRS, 16: RANDOM MIN, 17: RANDOM SEC, 18: INITIAL HRS, 19: INITIAL MIN, 20: INITIAL SEC, 21: ASSIGNED WIN†, 22: PREAMBLE†, 23: BUFFER†																		
220	DISPLAY CHAR(S)	CHAR†	CHAR†	CHAR†	CHAR†	CHAR†	CHAR†	CHAR†	CHAR†	CHAR†										

†Option Codes

<p>FLAG DESCRIPTIONS: 0 Output Flag 1-8, 11-18 User Flags 9 Intermed. processing disable flag</p> <p>83-92 CoMmanD codes: 0 Go to end of Pgm. Table 1-9, 79-99 Call Subroutine 10-19 Set Flag 0-9 High 20-29 Set Flag 0-9 Low 111-118 Set Flag 11-18 High 211-218 Set Flag 11-18 Low 30 Then Do 31 Exit Loop if True 32 Exit Loop if False 41-48 Set Port 1-8 High 51-58 Set Port 1-8 Low 49 Turn Switched 12 V On 59 Turn Switched 12 V Off 61-68 Toggle Port 1-8 71-78 Pulse Port 1-8 Ports can be indexed with C (--)</p> <p>85 SUBROUTINE: Subroutine number valid entries are 1-9, 79-99; 95 - 98 allow special interrupts on C5 -C8</p> <p>88,89 COMPARISON codes: 1 = 2 ≠ 3 ≥ 4 <</p>	<p>91 COMPARISON codes: 1x Do if Flag x is High 2x Do if Flag x is Low 4y Do if Port x is High 5y Do if Port x is Low 40 Do if modem is On 50 Do if modem is Off 49 Do if Switched 12 V is On 59 Do if Switched 12 V is Off Ports can be indexed with C (--) x = 0-9, 11-18 y = 1-8</p> <p>92 Time into INTERVAL xxx T and INT in minutes (T max is 1439, INT max is 1440) xxx-- T and INT in seconds (T max is 59, INT max is 60)</p> <p>96,*8 DEVICE/baud codes (y = baud code): Addressed Print Device 1y Printable ASCII 2y Comma separated ASCII 3y Binary Final Storage format</p> <p>Serial Printer or Computer (Index --) for RS-232 4y Printable ASCII 5y Comma separated ASCII 6y Binary Final Storage format</p> <p>Storage Module 7N Storage Module, address N (1-8) 7N -- Filemark to Storage Module N (1-8)</p>	<p>Transfer Data to Other Final Storage Area 80 New data only (Inst. 96 only) 81 All data (Inst. 96 only)</p> <p>Baud Rate Codes y = 0 300 1 1200 2 9600 3 76.8k 4 2400 5 4800 6 19.2k 7 38.4k</p> <p>97 MODEM/baud codes (y = baud code): 0y RF Modem (ME) 1y Short Haul/Direct 2y Phone Modem 3y Voice Call-back 4y Voice Modem 5y RF Modem (SDC state) 6y Direct Connect via RS-232 Port</p> <p>98 DEVICE/baud codes (y = baud code): 1y Addressed Print Device 4y Pin-enabled CS I/O Port 4y-- Pin-enabled RS-232 Port</p> <p>120 BUFFER A B C A Mode 0 - binary 1 - ASCII 2 - 18-bit, high-resolution</p>	<p>B Buffer 0 - Self-timed 1 - Random C New data 0 - Appends new data to old 1 - Writes over old data</p> <p>122 OPTION 0 - FS to Galaxy 1 - Check/Load Clock 2 - Check for Mail</p> <p>123 ASSIGNED transmission WINDOW 0 - 1 minute 1 - 2 minute</p> <p>123 PREAMBLE 0 - Short (0.98 seconds) 1 - Long (7.3 seconds)</p> <p>123 BUFFER 1 - Self-timed 2 - Random 3 - Both</p> <p>220 CHARACTER (Not all are listed, see CR23X manual) XXX-- Displays value stored in Loc XXX 13 Clears Display 16 Turns Display Off 48-57 0-9 65-90 A-Z 97-122 a-z 128 Beginning of Top line 192 Beginning of Bottom line</p>
---	--	--	--

ERROR CODES

- | | |
|---|--|
| <ul style="list-style-type: none"> 3 -- Program Table full 4 -- Intermediate Storage full 5 -- Final Storage Area 2 not allocated 8 -- CR23X was reset by watch dog timer 9 -- Insufficient Input Storage 10 -- Low battery voltage 11 -- Attempt to allocate unavailable storage 12 -- Duplicate *4 ID 13 -- Low External 5V Supply 20 -- Subroutine encountered before END of previous subroutine 21 -- END without IF, LOOP, or SUBROUTINE 22 -- Missing END 23 -- Non-existent SUBROUTINE 24 -- ELSE in SUBROUTINE without IF 25 -- ELSE without IF 26 -- EXIT LOOP without LOOP 27 -- IF CASE without BEGIN CASE 30 -- IFs and/or LOOPS nested too deep 31 -- SUBROUTINES nested too deep 32 -- Instruction 3 and interrupt subroutine use same port | <ul style="list-style-type: none"> 33 -- Cannot use control port 6 as counter with Instruction 15 or SDM/SDI-12 instructions 40 -- Instruction does not exist 41 -- Incorrect Execution Interval 60 -- Insufficient Input Storage 61 -- Burst Measurement Scan Rate too Short 62 -- Illegal Parameter 1 for FFT Instruction 68 -- Insufficient P68/P63 after P118 92 -- Interval for P92 too large 101 -- TGT1 Did Not Respond 102 -- Invalid TGT1 Parameter 107 -- Second CSAT3 instruction not nested <p>*D Mode Errors</p> <ul style="list-style-type: none"> 94 -- Program storage area full 95 -- Flash program does not exist 96 -- Addressed device not connected 97 -- Data not received within 30 seconds 98 -- Uncorrectable errors detected 99 -- Wrong file type or editor error |
|---|--|

DAY OF YEAR CALENDAR

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
JAN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
FEB	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		
MAR	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
APR	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
MAY	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151
JUN	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	
JUL	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212
AUG	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
SEP	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	
OCT	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
NOV	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	
DEC	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365

Add 1 to unshaded values during leap years.



CAMPBELL SCIENTIFIC, INC.

815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540
 Offices also located in: Australia • Brazil • Canada • England • France • South Africa

Copyright © 1998
 Campbell Scientific, Inc.
 Printed November 1998