

CR10 PROMPT SHEET

(OS10-0.1, OS10-1.1 & OS10-2.1 PROMs)

This prompt sheet briefly details the CR10's instruction set and command structure. It is intended for field use or as a reference by those familiar with CR10 programming; more detailed information and examples are available in the CR10 Operator's manual. Computer-assisted programming and communications are supported by PC208 Software's EDLOG and GraphTerm programs.

*MODES

To enter each Mode, key in a * ("star"), followed by the desired mode number.

KEY DEFINITION SUMMARY

Common keystrokes used to interrogate and program the CR10 via the CR10KD or a remote terminal.

- | | |
|---|--|
| 0-9 Key in numeric data, instruction number, or parameter | C Change the sign of a floating point number or Index an input location |
| A Enter the displayed number, or advance through a program table or data storage | D Enter a decimal point |
| B Back up through a program table or data storage | # Clear digit just keyed; display storage location number |

*0 - Compile program, begin LOGging data

*1, *2, *3 - Display/Enter Program Instructions

- 01:xx Advance to a given Instruction location
 - 01:x.xxxx Execution Interval (except in *3):

Valid entries are multiples of: for Range of:

1/64 (0.015625) s. 1/64 to 1 s.

1/8 (0.125) s. 1 to 32 s.

1 s. 32 to 8191 s.
 - 01:Pxx Program Instruction (see following pages)
- (02: or 03: is displayed in Tables 2 & 3 respectively)

*Commands Specific to *1, *2, and *3 Modes:*

- #A Advance to next instruction
- #B Back up to previous instruction
- #D Delete entire instruction

*5 - Display/Set Datalogger Time

- :HH:MM:SS (displays current datalogger time)
- 05:xx Year
- 05:xxxx Day of Year (Calendar on back)
- 05:HHMM Hours Minutes

*6 - Display/Change: Input Storage Data Values, Flags, or Port status. Compile Program without resetting Input Storage Data Values, Flags or Ports

- 06:xxxx Advance to a given Input Storage Location

*Commands Specific to *6 Mode while viewing an Input Location:*

- # Display Input Location Number or enter location to advance to
- C Enter value in Input Location
- D Display flags 1-8, toggle flag w/keys 1-8
- 0 Display ports 8-1, toggle port w/keys 1-8

*7 - Display Final Storage Data

- 07:xx Select area 1 or 2 (skipped if 2 not allocated)
- 07:xxxxx DSP location; enter location to advance to

*Commands Specific to *7 Mode:*

- # 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 - Start 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 - Storage Module Commands

See Storage Module manual

*A - Display/Change Memory Allocation

- 01:xxxx Input Storage Locations
- 02:xxxx Intermediate Storage Locations
- 03:xxxxx Final Storage Locations - Area 2
- 04:xxxxx Final Storage Locations - Area 1
- 05:xxxx Remaining program memory (bytes)

*B - Display Signatures/Status

- 01:xxxxx Program signature
- 02:xxxxx EPROM signature
- 03:xx K bytes memory: RAM + ROM
- 04:xx No. of E08's (key 88 to reset)
- 05:xx No. of table overruns (key 88 to reset)
- 06:xxx.x Version number
- 07:xxxx Revision number

*C - Display/Change Security

- 01:xxxx Lock *1, *2, *3, *A, *D
- 02:xxxx Lock *5 & *6 display only
- 03:xxxx Lock *7, *8, *9, *B; telecommunication commands except A, L, and E

*D - Store/Load Programs

- 1 - Print program (ASCII)
- 2 - Load program (ASCII)
- 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

NOTE: x represents a digit from 0 to 9 unless otherwise defined.



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CR10 INSTRUCTION AND PARAMETER SUMMARY

INPUT/OUTPUT INSTRUCTIONS

INST.	01:	02:	03:	04:	05:	06:	07:	08:	09:	10:
1 VOLT (SE)	REPS	RANGE†	SE CHAN	LOC	MULT	OFFSET				
2 VOLT (DIFF)	REPS	RANGE†	DIFF CHAN	LOC	MULT	OFFSET				
3 PULSE	REPS	PULSE CHAN	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. CHAN†	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†	SE CHAN	TC TYPE†	REF. LOC	LOC	MULT	OFFSET		
14 TC TEMP (DIFF)	REPS	RANGE†	DIFF CHAN	TC TYPE†	REF. LOC	LOC	MULT	OFFSET		
16 RTD TEMP	REPS	R/Ro LOC	LOC	MULT	OFFSET					
17 INTERNAL TEMP	LOC									
18 TIME	OPTION†	MOD/BY	LOC							
19 SIGNATURE	LOC									
20 PORT SET	8765†	4321†								
22 EXCIT w/DEL	EX.CHAN	DEL w/ex.	DEL after ex.	EXCIT mV	(del. units-0.01s)					
§ 24 CALIBRATION	LOC†									
25 READ PORTS	MASK†	LOC†								
26 TIMER	LOC (0 resets timer)									
27 PERIOD AVG (SE)	REPS	OP/GAIN†	SE CHAN	NO. CYC.	LIM (0.01s)	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 PS9105	DIFF CHAN	EX.CHAN	LOC	ENHANCED PARAMETERS (CSI	PARAMETERS 4-23)†					
101 SDM-INT8	ADDR	C:8765†	C:4321†	F:8765†	F:4321†	OUT. OPT.†	LOC	MULT	OFFSET	
102 SDM-SW8A	REPS	ADDR	FUNC†	CHAN	LOC	MULT	OFFSET			
103 SDM-A04	REPS	ADDR	LOC							
104 SDM-CD16	REPS	ADDR	LOC							
§105 SDI-12 RECORDER	ADDR	CMD†	PORT	LOC	MULT	OFFSET				
§106 SDI-12 SENSOR	ADDR	TIME/VAL†	LOC							

INST.	01:	02:	03:	04:	05:	06:	07:	08:	09:	10:	11:	12:
•23 BURST MODE	NO. CHAN	RANGE†	IN CHAN	OPTION†	SCAN(ms)	SCANS (10 ³)	TR. OFF.	TR. LIM.mV	EXCIT mV	LOC	MULT	OFFSET

† Option Codes

1-14 RANGE codes: Slow (2.72 ms integration time) Fast (250 µs integration time) 60 Hz rejection 50 Hz rejection Full scale range 1 11 21 31 ± 2.5 mV 2 12 22 32 ± 7.5 mV 3 13 23 33 ± 25 mV 4 14 24 34 ± 250 mV 5 15 25 35 ± 2500 mV	23 OPTION code, 4 digits: ABCD A Trigger 0 -- Trigger on 1st analog channel 1 -- Digital trigger on C1 2 -- Same as 0, but sets C1 high on trigger 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 -- Input Storage 1 -- Serial port, 9600 baud 2 -- Serial port, 76800 baud 3 -- Serial port, 76800 baud to SM192/SM716 Storage Module D Measurement 0 -- Differential measurement 1 -- Single-ended measurement	24 LOCation (start of 19 calibration values) xxxx Calibrate only when 24 is executed xxxx-- (key in C before entering) store results of automatic calibration 25 MASK: Base 2 representation of ports 8-1; 1 means read, 0 yields 0. Entered as base 10 (0-255). LOCATION: Result also base 2 converted to 10 1 indicates high, 0 indicates low or masked 27 Option/GAIN codes: Code Gain x1 100 x2 33.3 x3 10 x4 1 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) LOC: Output is 1/T ² , T is period in ms 29 Enhanced Parameters These parameters are listed on the manufacturer's calibration sheet, where:	CSI Par. 04: 1 05: 2 06: 3 23: 20 101 C:8765, C:4321 Each digit Configures respective channel 0 High level, rising edge 1 High level, falling edge 2 Low level, rising edge 3 Low level, 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 OUTPUT 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 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: ttn: ttt = time (seconds) n = No. values
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PROCESSING INSTRUCTIONS

(F is fixed data (constant); X, Y, & Z are input locations)

INST.		01:	02:	03:	INST.	01:	02:	03:	04:	05:	06:	07:	08:	09:
30	Z=F	F	EXP 10	Z	47	Z=X ^Y	X	Y	Z					
31	Z=X	X	Z		48	Z=SIN(X)	X	Z						
32	Z=Z+1	Z			49	SPA. MAX	SWATH	1ST LOC	MAX LOC†					
33	Z=X+Y	X	Y	Z	50	SPA. MIN	SWATH	1ST LOC	MIN LOC†					
34	Z=X+F	X	F	Z	51	SPA. AVG	SWATH	1ST LOC	AVG LOC					
35	Z=X-Y	X	Y	Z	53	A * X+B	START LOC	A1	B1	B2	A3	B3	A4	B4
36	Z=X * Y	X	Y	Z	54	BLOCK MOVE	NO. VALS	S.LOC	STEP	D.LOC	STEP			
37	Z=X * F	X	F	Z	55	POLYNOMIAL	REPS	X	F(X)	C0	C1	C2	C3	C4
38	Z=X/Y	X	Y	Z										
39	Z=SQRT(X)	X	Z		\$56	SAT. VP	TEMP	VP						
40	Z=LN(X)	X	Z		\$57	WB/DBT to VP	PRESSURE	DB TEMP	WB TEMP	VP				
41	Z=EXP(X)	X	Z		58	LP FILTER	REPS	INPUT X	RESULT X	WGHT.F.				
42	Z=1/X	X	Z		59	RF (X/1-X)	REPS	X	MULT (RF)					
43	Z=ABS(X)	X	Z		61	INDIR MOVE	SOURCE X	DESTIN X						
44	Z=FRAC(X)	X	Z		63	PARA. EXTN.	†(8 parameters, depends on the inst. that 63 follows)							
45	Z=INT(X)	X	Z		\$64	PAROSCIENTIFIC	START LOC†	START LOC†						
46	Z=X MOD F	X	F	Z	♦\$65	BULK LOAD	F	F	F	F	F	F	F	LOC
					66	Z=ARCTAN(X/Y)	X	Y	Z					

† Option Codes

49, 50	MAX/MIN: 0xxx Store spatial max or min at loc xxx 1xxx Store max or min at loc xxx and loc of max or min at xxx+1	63	PARAMETERS 1-8: Following Inst. 97 RF IDs & Phone No.; 1 digit at a time 32 Between RF IDs (e.g. repeater & site) 84 Between RF & DC112 No. 13 To end	64	START LOC: Para. 1 Start Loc: Temp (µs), pressure (µs), V0...T5 Para. 2 Start Loc: Temp (°C), Signature
					Following Inst. 98 (256 character limit) Base 10 value of ASCII Character (1-99) 00 To end

OUTPUT PROCESSING INSTRUCTIONS

INST.		01:	02:	03:	04:	05:	06:	07:	INST.		01:	02:
69	WIND VECTOR	REPS	SMPL/SUBINT†	SEN/OUT.†	WS/E	WD/N			77	REAL TIME	OPTION†	
70	SAMPLE	REPS	LOC						78	RESOLUTION	OPTION†	
71	AVERAGE	REPS	LOC						79	SMPL ON MAX/MIN	REPS	LOC
72	TOTALIZE	REPS	LOC									
73	MAXIMIZE	REPS	TIME†	LOC					80	STORE AREA	AREA†	LOC/ID
74	MINIMIZE	REPS	TIME†	LOC					82	STD DEV	REPS	LOC
\$75	HISTOGRAM	REPS	BINS	FORM†	B.SEL.LOC	WV LOC†	LOW LIM	HIGH LIM				

† Option Codes

69	SamPLes/SUBINTERval (std dev): 0 No subinterval xxxx Number of scans per subinterval	73,74	TIME of max or min: 00 Max/min value only 01 With seconds 10 With Hour-Minute 11 With Hour-Minute, Second	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)
	SENsor type/OUTput codes: x0 Avg WS, Θ1; σ (Θ1) x1 Avg WS, Θ1 x2 Avg WS, resultant U, Θu; σ (Θu) x = 0 (anemometers & vanes) x = 1 (north- & east-facing propellers) Where: Θ1 = Avg unit vector dir σ(Θ1) = Std dev dir (Yamartino) Θu = Avg resultant vector dir σ(Θu) = Std dev dir (CSI)	75	FORM codes: 0 Open form (data beyond limits are included) 1 Closed form (data beyond limits are excluded)	78	OPTION codes: 0 Low resolution 1 High resolution
			WV LOCATION: 0 frequency distribution xxxx Weighted value loc	80	AREA codes: 1 Final Storage 1 2 Final Storage 2

PROGRAM CONTROL INSTRUCTIONS

(F is fixed data (constant); X, Y, & Z are input locations)

INST.		01:	02:	03:	04:	INST.	01:	02:	03:	04:	05:	06:	07:	08:
83	IF CASE < F	F	CMD†			92	IF TIME	T into INT†	INT	CMD†				
85	BEGIN SUBR	SUBR†				93	BEGIN CASE	CASE LOC						
86	DO	CMD†				94	ELSE							
87	LOOP	DELAY	COUNT			95	END							
88	IF X <=> Y	X	COMP†	Y	CMD†	96	SERIAL OUT	DEVICE†						
89	IF X <=> F	X	COMP†	F	CMD†	97	INITIATE TELE.	MODEM†	FLAG	LIM(sec)	F.DEL(sec)	NO. TRIES	S.DEL (min)	FAIL LOC ID
90	LOOP INDEX	STEP				98	SEND CHAR.	DEVICE†						
91	IF FLAG/PORT	COMP†	CMD†											

† Option Codes

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 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 61-68 Toggle Port 1-8 71-78 Pulse Port 1-8 Ports can be indexed with C (-)	92	Time into INTERVAL xxx T and INT in minutes xxx-- T and INT in seconds	97	MODEM/baud codes: 0y RF MODEM 1y SHORT HAUL 2y DC112 y = Baud Rate Code (97 is followed by Inst. 63)
85	Subroutine number valid entries are 1-9, 79-99; 97 & 98 allow special interrupts on C7 & C8		FLAG DESCRIPTIONS: 0 Output flag 1-8 User flags 9 Intermed. proc. disable flag	98	DEVICE/baud codes: 1y Addressed Print Device 4y Pin-Enabled Print Device y = Baud Rate Code (98 is followed by Inst. 63)
88,89	COMParison codes: 1 = 3 ≥ 2 ≠ 4 <		Addressed Print Device 1y Printable ASCII 2y Comma delineated ASCII 3y Binary Final Storage format		BAUD RATE CODES 0 300 2 9600 1 1200 3 76800
91	COMParison codes: 1x Do if flag x is high 2x Do if flag x is low		Serial Printer or Computer 4y Printable ASCII 5y Comma delineated ASCII 6y Binary Final Storage format		

ERROR CODES

3 -- Program Table full
 4 -- Intermediate Storage full
 5 -- Final Storage Area 2 not allocated
 8 -- CR10 was reset by watch dog timer
 9 -- Insufficient Input Storage
 11 -- Attempt to allocate unavailable storage
 20 -- Subroutine encountered before necessary END
 21 -- END without IF, LOOP, or SUBROUTINE
 22 -- Missing END
 23 -- SUBROUTINE does not exist
 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
 40 -- Instruction does not exist
 41 -- Incorrect Execution Interval
 60 -- Insufficient Input Storage for FFT
 61 -- Burst Measurement Scan Rate too Short

*D Mode Errors

96 -- Device not connected
 97 -- Time out on tape read
 98 -- Uncorrectable errors on tape read
 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.



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