

### Overview

This application note details the command syntax used for encoded URL and Telnet controller communications.

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### 1. Encoded URL – Telnet Syntax

URL encoded commands are formatted by your browser as: URL/taco.cgi?F0 = Field0Value & F1 = Field1Value .... Where URL = IP address of controller.

Telnet uses the URL encoded commands, comma delimited, with Field names deleted. Refer to 4.2 for details.

Field	Range	Function	Notes
<b>F0</b>	2 Letter Command [AA .. OV]	1 <sup>st</sup> Letter <b>A</b> = Admin, system level command <b>B</b> = Browser page selector <b>C</b> = Communications <b>I</b> = Input command <b>O</b> = Output command  2 <sup>nd</sup> Letter – sub-function <b>A..Z</b>	Required field.  <b>B</b> commands are navigation only  <b>O 1..10</b> are ON/OFF relays <b>11.18</b> are 4-20mA outputs
<b>F1</b>	Target I/O [A..Z or 1...18]	Command applies to either: An Input <b>A..Z</b> An Output <b>1..18</b> An Admin or <b>BS</b> command selection	1. Required field for <b>Ox</b> & <b>Ix</b> commands 2. Outputs 1..10 are relays. 3. Outputs 10..18 are 4-20mA outputs
<b>F2 To F15</b>	<b>F2,F3,F4...F15</b>	Command field 2..15	Start of optional fields

#### Syntax: URL Parsing:

- Field **F0** is required in every encoded URL.
- Invalid syntax generates an error page containing the faulted, encoded URL.
- Fields **F0** & **F1** are required fields for **Ox** & **Ix** commands and must be encoded in this order. Fields **F2..F13** may be in any order. Fields will be correctly sequenced by the parser.
- Spaces ('+'), are converted in the parser. Spaces in I/O names are retained. Spaces in other fields are stripped from the field value.
- Encoded Hex characters (%NN) are converted to ACSII in the parser within the range 0x20 Hex = space to 0x60 Hex = apostrophe.
- A field with value == '!' deletes an existing field value. The action on deletion varies with the active command. For example: an Input compensation or an Output special control may be deleted; setting the value of the field to 'none'. Some fields may not be deleted. For example: Setpoint fields cannot be deleted.
- Password level required for URL: There are three levels of users, Public: No Password Required. Operator & Admin userids require password. Admin may enable passwords for local keypad access. Diagnostic pages may be viewed by Public. Editing causes a Login page unless logged in.

### 2.Commands

#### 2.1 Commands.Admin

Admin	Command# : Syntax : Password	Function & notes
<b>AA</b>	0: Admin Alarms: public F0 F1 F2 F3 <b>AA [0..5] [State] [Modify 1/0]</b> F4 F5 F6 <b>[Relay 1/0 ] [ Dial-out 1/0 ] [Reset 1/0]</b>	System Level alarm control - state  F2 Telnet, read only byte F3 req'd by browser for selection F3-6 are 1/0 = ON/OFF
<b>AC</b>	1: Admin Configure: admin F0 F1 F2 <b>AC [Clear Alarms 1/0 ] [ Site Name ]</b> F3 F4 <b>[ Controller Name ] [ Reset Event Day 1/0]</b> F5 F6 <b>[Metric 1/0 ] [ LCD Passwords 1/0 ]</b> F7 F8 <b>[Alarm Relay 1/0 ] [ Load Config 1/0 ]</b> F9 F10 <b>[Save Config 1/0 ] [ Restart 1/0 ]</b>  <i>Warning:</i> Do not disclose the admin password. Inadvertent execution of this command's options may result.	F1 is global alarm reset. All owed times & lockout times =0, all alarms reset.  F4..9 1=TRUE, default 0=FALSE  F4 = Sets Day1 of Event Timer to most recent Sunday (Only significant for 28 day cycles).  F5 = Default US units.  F7 1 = contacts closed on alarm 0 = contacts open on alarm (Default)  F8 1 = Load controller configuration from Flash to RAM. Loads Factory default  F9 1 = Save controller configuration to Flash. Overwrites Factory default.  F10 1= Software reset, restarts controller, registers driver cards, re-inits modem, verifies controls .....
<b>AD</b>	2: Admin Diagnostic: public F0 <b>AD</b>	System level diagnostic, current system state  Current state table, varies with configuration
<b>AE</b>	3: Admin Enable: operator F0 F1 F2 <b>AE [Input A..Z ] [Output 0..17]</b>	Disable function in <b>IC &amp; OS</b>  Enable selected I/O. Log period starts on Enable. Ignores Enabling an already enabled I/O
<b>AI</b>	4: Admin IDs: operator F0 F1 F2 <b>AI [ User ID ] [ Password1st ]</b> F3 <b>[ Password 2<sup>nd</sup> ]</b>	<b>AI:</b> userid table  Change Password requires 1 <sup>st</sup> & 2 <sup>nd</sup> password match.

Admin	Command# : Syntax : Password	Function & notes
<b>AL</b>	5: Admin Login: public F0 F1 F2 F3 <b>AL [User ID ] [Password ] [Logout 1/0]</b>	<i>Browser only command</i> Login for Operators & Admin. Login times-out if Logout does not occur
	Application note AN_T002	
<b>AR</b>	7: Admin Reset Alarms: public F0 F1 <b>AR [Clear Alarms 1/0]</b>	Display current alarms table. F1 is global alarm reset. All owed times & lockout times =0, all alarms reset.
<b>AT</b>	8: Admin Time & Date: operator F0 F1 F2 F3 <b>AT [ YYYY-MM-DD] [HH:MM:SS] [Day 0-6]</b>	Undefined fields use current controller clock value. F3 0 = Sunday  Changing the time date, power-up, enabling restart log periods..
<b>AU</b>	9: Admin Upgrade: public <b>AU [ Upgrade Code ]</b>  <i>Warning:</i> Any successful execution of this command Resets the admin password to factory default. <b>AU</b> is the password reset mechanism.	Locked to controller serial#. Default command if Ethernet option not enabled.  Turns ON options: FV, LAN  Resets All Passwords & Userids.

### 2.2 Commands.Communications

Browser	Syntax	Function
<p><b>BS</b></p> <p><b>TOP</b></p> <p><b>Menu Bar Sequence</b></p> <p><b>BOTTOM</b></p>	<p>10: Browser Selector: public <b>BS [ C / I / O / S ]</b></p> <p>Executes on-click with <b>F0=BS</b>, &amp; <b>F1=varies</b></p> <p>View : <b>V</b> Inputs – Sensors: <b>I</b> Outputs - Controls: <b>O</b> Alarms: <b>A</b> System: <b>S</b> Communications: <b>C</b> HELP: Link <b>L</b></p>	<p>Browser navigation commands Select from fixed frame LHS menu.</p> <p>Some menu options link directly to cgi functions. Others use the <b>BS</b> command to refine selection</p> <p>I/O requires another selection for the I/O point.</p> <p>Default View lists current values for all enabled I/O, grouped by 'Sensor &amp; Output' followed by Sensors not controlling outputs and then Outputs not controlled by sensors.</p> <p>Menu Bar sequence ordered by frequency of use.</p>
<p><b>Navigation</b></p>	<p><b>BS A</b> links to: <b>AR</b> <b>BS C</b> links to a selector: CC / CD / CK / CM <b>BS I</b> links to a selector: IA / IC / ID / IL <b>BS L</b> uses link set by CC - Gateway <b>BS O</b> links to a selector: OA / OC / OD / OE / OF / OS / OV <b>BS S</b> links to a selector: AA / AC / AD / AE / AI / AL / AM / AT / AU <b>BS V</b> buttons to: <b>AR</b> &amp; <b>AL</b> appear on the Default view page with the Login button</p>	<p>Notes: <b>BS</b> Commands link to <b>C, I, O, &amp; S</b> selectors:</p> <p>A number of commands are accessible by more than one navigation path.</p> <p>The Telnet parser cannot execute <b>BS</b> commands</p>

Comm	Command# : Syntax : Password	Function & notes
<b>CC</b>	11: Communications Configure: admin F0 F1 F2 F3 <b>CC [ IP Address ] [ Netmask ] [ Gateway ]</b> F4 F5 <b>[ Logout 1 / 0 ] [ Ringcount 1..10 ]</b> F6 F7 <b>[ Modem init ] [ Timezone 0..23 ]</b> F8 F9 F10 <b>[ HTML Port ] [ Telnet Port ] [MAC]</b> <i>Warning:</i> Do not disclose the admin password. Inadvertent execution of this command's options May result.	F3 Optional, HELP link requires [ Gateway ]  F4 1 = Set user to 'public'.  F5 Default 1, Rings before modem pick-up  F6 19 characters MAX.  F7 Used in HTML header  F8 Default & Reset to 80 F9 Default & Reset to 23 F10 Information only, cannot be modified
<b>CD</b>	12: Communications Diagnostic: operator F0 F1 F2 <b>CD [Force Dial-out 1/0] [Target 1..4 ]</b> F3 F4 <b>[CarrierDetect ON-OFF] [ Mirror LCD 1/0 ]</b> F5 F6 <b>[View Refresh (secs)] [ Parser 1/0 ]</b>	F2: Select dial-out phone# 1..4  F3: Read Only, write ignored  F4 displays LCD in browser 'View', BS V  F5 default 30 secs., min=10, max=300  F6 displays deconstructed, encoded portion of URL. Default OFF. Resets @ mid-night
<b>CK</b>	13: Communications Keypress Log: public F0 <b>CK</b>	Displays keypress table
<b>CL XML</b>	14: Communications Log: operator F0 F1 <b>CL [ Start Date YYYY-MM-DD ]</b> F2 <b>[ End Date YYYY-MM-DD ]</b>	XML Download of Controller Data Log Start & End are HH:MM = 00:00 No F2, downloads to date No F1 or F2 downloads all
<b>CM</b>	15: Communications Modem Configure: admin F0 F1 F2 F3 <b>CM [Target 1..4] [ Phone# ] [Pager msg]</b> F4 F5 <b>[ Pager Delay (sec) ] [ pageout 1/0 ]</b>	F3 numeric only  F4 is delay in seconds from dial to pager message transmit if 'pageout' set for Target phone#
<b>CS Telnet</b>	16: Communications Streaming: operator F0 <b>CS</b>	Active CS command blocks timeout on userid disconnect. Not accessible from browser. Current, enabled I/O state & value One data set per 'CS' request

### 2.3 Commands.Inputs

Inputs	Command# : Syntax : Password	Function & notes
<p><b>IA</b></p>	<p>17: Input Alarms: S:Sensor Types: operator            F0 F1 F2 F3  <b>IA [A..N] [High Alarm ] [Low Alarm]</b>            F4 F5  <b>[Delay (min) ] [Alarm Relay 1/0]</b>            F6 F7  <b>[Dial-Out 1/0] [ Clear Alarm 1/0 ]</b></p> <p>Input Alarms, M:Meter types: operator            F0 F1 F2 F3  <b>IA [O..Z] [High Volume ] [Low Volume]</b>            F5 F6  <b>[Alarm Relay 1/0] [Dial-Out 1/0]</b>            F7  <b>[ Clear Alarm 1/0 ]</b></p> <p>Input Alarms, C:contact types: operator            F0 F1 F2  <b>IA [O..Z] [Time Closed minutes ]</b>            F3  <b>[ Time Open minutes ]</b>            F5 F6  <b>[Alarm Relay 1/0] [Dial-Out 1/0]</b>            F7  <b>[ Clear Alarm 1/0 ]</b></p>	<p>F2 High Volume / Day trips immediately.            F3 Low Volume / Day tested at end of day.</p> <p>F2 Set to 1500 for flow switches            F3 Set to 0 for alarm on no flow.</p>

Inputs	Command# : Syntax : Password	Function & notes
<p><b>IC</b></p>	<p>18: Input Configure: operator            F0 F1 F2 F3 F4 F5  <b>IC [A..Z] [Type] [Name] [Gain] [Offset]</b>            F6 F7 F8  <b>[Units] [Resolution] [Compensation Type]</b>            F9 F10  <b>[Comp. Param1] [Comp. Param2]</b>            F11 F12  <b>[Disable 1/0] [Sensor Type]</b>            F13  <b>[Log rate 5-1440 minutes]</b></p> <p>Fields, not applicable to 'Type' are ignored.</p>	<p>F2 Type : S: Sensor            M: Meter, Volume Measurement            Falling edge triggered.            C: Contact, Closed=ON</p> <p>F7 0..3 digits after decimal point</p> <p>F8 Compensation:  <b>Write:</b> '!'(none) CA / CH / CR / IN / ME / RV / TC / TM  <b>Read:</b>            "None", ! (Remove compensation)            "Calculated Value", CA            "ContactHead Meter", CH            "Corrosion Rate", CM            "Inventory", IN            "Manual Entry", ME            "Rate-to-Volume", RV            "Thermal Compen.", TH            "Turbine Meter", TU</p> <p>F9 CR- Alloy number - float            RV-Target meter O..Z            TC- Thermal Sensor A..N</p> <p>F10 CR- Conductivity Sensor A..N            RV – Input rate in 'S'econds or 'M'inutes            TC – compensation multiplier, default 1.0097 per unit of compensating sensor</p> <p>F12 Read only text, set by installed card.            (See Appendix 5.IC for detail)            F13: default 60</p>
<p><b>ID</b></p>	<p>19: Input Diagnostic: public            F0 F1  <b>ID [A..Z]</b></p>	<p>Current state table, varies with configuration:            Type: Water meters – this year &amp; last year            Type: Corrosion Rate – interim measurement values</p>
<p><b>IL</b></p>	<p>20: Input Level-Calibrate : operator            F0 F1 F2 F3  <b>IL [A..Z] [1st point] [2nd point]</b>            F4 F5 F6  <b>[Reset 1/0] [Override 1/0] [1st value mV]</b>            F7  <b>[2nd value mV]</b></p>	<p>F2 &amp; F3 are in sensor units.</p> <p>F4 resets to factory default based on Type &amp; Hardware Type#</p> <p>F5 overrides warning message on failed calibration            F6 &amp; F7 are state values required for two point calibrations.</p>



## 2.4 Commands.Outputs

Output	Command# : Syntax : Password	Function & notes
<b>OA</b>	21: Output Alarms – TimeOuts: operator F0 F1 F2 F3 <b>OA [1..10] [ Minutes ON ] [ Minutes/Day ]</b> F4 F5 <b>[OFF on alarm 1/0] [ Clear Alarm 1/0 ]</b> F6 F7 <b>[ Alarm Relay 1/0 ] [ Dial-Out 1/0 ]</b>	F1 limited 1..10, not applicable to 11,,18 (Enabled C1-C8 alarm on open loop only)  F4 0= Ignore alarm 1= OFF on alarm If 'Control Eq'n' of Input type 'meter' Time owed is reset on alarm.  F5 1= Clear Alarm, Owed & Lockout Times =0
<b>OC</b>  <b>Relays</b>	22: Output Configure: operator  F0 = Relays 1-10 F0 F1 F2 <b>OC [1..10] [ Control Eq'n ]</b> F3 F4 <b>[ Turn ON /Volume ] [Turn OFF / Time ]</b> F5 F6 <b>[ Interlocks ] [ Blocking Relays ]</b> F7 F8 <b>[ Type ] [Special Control ]</b> F9 F10 F11 F12 <b>[ SC-P1 ] [ SC-P2 ] [ SC-P3 ] [ SC-P4 ]</b> F13 F14 <b>[ SC-P5 ] [ Variable Cycles ON 1/0]</b> F15 <b>[Feed Verify ON 1/0]</b>	F2 – See Section 3.0  F5 String of input of type contact O...Z OR'd as O/P, ANDed as O+P, max 4 F6 String of 1+..10, max 4, excluding F1  F7 Type DF = Falling Setpoint DR = Rising Setpoint (Default) OS = ON between Setpoints EF = Falling during events ER = Rising during events ES = Between Setpoints, during events  Special Control (SC) F8 1 of BF / CS / BT / HT / PL / PT / TC /TM  F9: SC-Param1 BF,BT,PL-Target Relay CS-Sampling secs HT-Hours PT-%Overtime TC- Overtime minutes TM – Period seconds F10: SC-Param2 BF,BT-% Overtime CS-Measure secs PL – lockout time minutes TC – Period minutes  F11: SC-Param3 CS – Blowdown time secs PL - Prebleed time minutes F12: SC-Param4 CS - Resample time minutes PL – Prebleed sensor A..N F13: SC-Param5 CS – Fail-to-Sample input O..Z PL – Prebleed sensor value
<b>Current Loops C1 to C8</b>	F0 = 4-20mA Outputs 11-18 F0 F1 F2 <b>OC [11..18] [ Control: A..N 1..10 ]</b> F3 F4 <b>[ 4mA level] [ 20mA level ]</b> F5 F6 <b>[ Interlock O..Z ] [ Manual/Auto 1= Toggle ]</b> F7 <b>[ Manual % 0-100 ]</b>	

Output	Command# : Syntax : Password	Function & notes
<b>OD</b>	23: Output Diagnostic: operator F0 F1 F2 <b>OD [1..18 ] [ Prime time minutes ]</b>	Current state table, varies with configuration  F2 > 0 starts prime F2 = 0 end prime
<b>OE</b>	24: Output Events: operator F0 F1 F2 F3 <b>OE [1..10] [ Action A/E/D/R ] [ Event #1..28]</b> F4 F5 F6 <b>[ Day# ] [Start HH:MM ] [OnTime Minutes ]</b> F7 <b>[ Frequency O(nce) / W(eekly) / A(lternate )</b>	Action = A[dd] E[dit] D[elete] R[eset], Frequency = O[nce], Frequency = W[EEKLY(28)   Daily(7)]   Hourly(1) Frequency = A[Alternate Weeks (28)   Days (7)   Hours (1)]  Frequency varies with selected Event Cycle. Refer to 'OS' command.  Keying errors in :MM set minutes=0.
<b>OF</b>	25: Output Feed Verify: operator F0 F1 F2 F3 <b>OD [1..10 ] [ FV Meter ] [ Inventory A..N]</b> F4 F5 <b>[ppm A..N ] [ Cycles Method F/V/C ]</b> F6 F7 <b>[ Cycles Value] [ V:letter or C:number ]</b>	Option only displayed if FV selected as a control. Linked from OC page. F3 & F4 optional.  F5 F: Fixed Cycles, V: Ratio of Volumes C: Conductivity Ratio F6 Required if F5=F F7 Bleed meter input or Cycle control relay
<b>OS</b>	26: Output Setup: operator F0 F1 F2 <b>OS [1..10] [ Name ]</b> F3 <b>[ Log rate 5-1440 minutes]</b> F4 F5 <b>[ Event Cycle 1 / 7 / 28 days ] [ Disable 1/0 ]</b>	4-20mA outputs: F2 / Name F3 loop offset trim +/-0.50 mA Default=9. Min=0, Max=30 F4 loop span trim. Default 950. Min=900, Max =1000 (4-20mA F3 & F4 are read-only)  F3 Default = 60, F4 Default = 28 F5 Enabled using AE command
<b>OV</b>	27: Output Variable Cycles: operator F0 F1 F2 F3 <b>OV [1..10] [Low Make-up] [ Low Cycles ]</b> F4 F5 <b>[ Mid Make-up ] [ Mid Cycles ]</b> F6 F7 <b>[ High Make-up ] [ High Cycles ]</b> F8 <b>[ Maximum Tower ]</b>	Option only displayed if VC selected as a control. Linked from OC page.  Uses a two letter control equation separated by a '/', ratio operator, typically E/G where E= Tower Conductivity, Numerator & G=Make up conductivity, Divisor. Make-up references the Divisor value Tower references the Numerator value. Disables output on removal of '/' operator

## 3. Configuration

### 3.1 IC: Input Configure

F0 F1 F2 F3 F4 F5 F6 F7 F8  
**IC [A..Z] [ Type ] [Name] [Gain] [Offset] [Units] [ Resolution ] [Compensation Type]**  
 F9 F10 F11 F12 F13  
**[Comp. Param1] [Comp. Param2] [ Disable 1/0 ] [ Sensor Type ] [Log rate 5-1440 minutes ]**

#### 3.1.1 Field 8 – Compensation

Type	Function Req'd fields	Notes
<b>CA</b>	Calculated value – ppm, volume None	Applied to Type 'S'ensor only Set & Cleared using 'OF' command
<b>CH</b>	Contact Head	Applied to Type 'M'eter only Turns On software denouncing. <b>Gain</b> = Volume/ closure
<b>CM</b>	Corrosion Rate F9 = Alloy Number (Float) F10 = Conductivity sensor A..N (Char)	Applied to Type 'S'ensor only
<b>IN</b>	Inventory None	Applied to Type 'S'ensor only Set & Cleared using 'OF' command Removed using the 'OS' command
<b>ME</b>	Manual Entry	No driver card installed or required. Sensors with driver cards, may be converted to ME, ignoring the sensor value.
<b>RV</b>	Rate-to-Volume F9 = Target Logging Meter O..Z F10 = Input Rate in 'S'econds or 'M'inutes	Applied to Type 'S'ensor only Requires '4-20 mA input card'
<b>TH</b>	Thermal Compensation F9 = Thermal Sensor A..N F10 = %/degree (Float) (0.01 = 1%/degree)	Applied to Type 'S'ensor only Uses 70F or 20C as zero compensation point. Example: 1%/F at 80F, 1000uS measured. Compensated Value = $1000 * (1.01 ^ (80-70))$ = 1104uS
<b>TU</b>	Turbine Meter None	Applied to Type 'M'eter only Removes software de-bouncing <b>Gain</b> = 'K' factor, pulses / unit volume
<b>CT</b>	Current Transformer (Factory Set)	Applied to input 'G' only. Blocks the use of G-H driver location by all drivers but 'IO', 4-20mA output driver.

### 3.1.2 Field 12, Type Number

Number (Card Type)	Sensor Type	ID Level mV (notes)	Card Offset	Default Gain	Default Offset	MAX Gain or Offset	MIN Gain or Offset
0	Unused	0		1	0	0	0
1 (CT)	Conductivity >100uS <100uS	75 1000	(10) 75 100	5.6	-35	10	2.5
2 (B)	Boiler Conduct'ity	50 (1)	50 (11)	2	-15	10	0.5
3 (B)	Condensate Cond.	208	208 (11)	8	-90	12	3
4 (OP)	PH Sensor Single Dual pH & ORP	1000 1100 (2) 1400 (3)	ID Level (11)	0.017	7	8	6
5 (OP)	ORP Sensor Single Dual pH & ORP	1200 1300 (4) 1400 (5)	ID Level (11)	-1	0	50	-50
6 (CT)	Temperature US Units Metric			0.18 0.1	-459.4 -273	-430	-590
7 (CI)	4-20mA Input	2200 (6)		1	0	0	0
8 (CR)	Corrosion Rate	1500 1600 (7)		1	0	0	0
9	Manual Entry	-	-	1	0	0	0
10	Calculated Value	-	-	100	0	0	0
11	Water meter	-	None	100	0	0	0
12	Contact set	-	None	1			
	4-20mA Output	2400 (8) 2500 (9)	None	1	0		

**ID Level** – installed driver cards identify themselves to the controller on power up.

**Card Offset** – Card offset allows measurement of bipolar voltages from pH & ORP sensors and measurements to zero sensor voltage.

#### Notes

1. Dual input cards may include a boiler and a condensate sensor.
2. Dual pH sensor card
3. pH on Card Input 1 & ORP on Card Input 2
4. Dual ORP sensor card
5. pH on Card Input 1 & ORP on Card Input 2
6. 4-20mA input always a dual input card
7. Dual corrosion rate sensor card
8. 4-20 mA output cards may be single or dual output.
9. Dual output 4-20mA card
10. Sensor 1 uses the card offset measured on Input 2 when the ID is asserted to determine user set jumper position and therefore current sensor drive level
11. Sensors 2-5 use ID\_level as raw A/D offset and to determine user set jumper position.

### 3.2 IL: Input Level - Calibration

F0 F1 F2 F3 F4 F5 F6 F7  
**IL [ A..Z ] [ 1st point ] [ 2nd point ] [Reset 1/0] [ Override 1/0 ] [ 1st value mV ] [2nd value mV ]**

#### Single Point Calibration

All inputs with the exception of 4-20mA, type 'CI' inputs, are single point calibrations. Calibration of contact set inputs is blocked.

##### SENSORS:

Conductivity, Calculated:	The controller adjusts the GAIN to match the user set Field F2 [ <b>1<sup>ST</sup> point</b> ] value.
Temperature, pH, ORP, Corrosion Rate:	The controller adjusts the OFFSET to match the user set Field F2 [ <b>1<sup>ST</sup> point</b> ] value.
Inventory, Manual:	The controller sets OFFSET to match F2 [ <b>1<sup>ST</sup> point</b> ] value. Since the GAIN on these inputs is zero, the OFFSET is the input value for control and logging.

**WATER METERS:** The user set Field F2 [ **1<sup>ST</sup> point** ] is Volume/contact for contact head meters and 'K' factor (Pulses per unit volume) for turbine meters.

Users can override the calculated OFFSET and GAIN using the IC command or the Sensor/Configure browser option.

The displayed value of a sensor = ( GAIN raw mV ) + OFFSET.

'raw mV' level is available: Telnet:ID command, Browser:Sensor/Diagnostic

Compensation (Temperature, Rate-Volume, Corrosion Rate...) is applied after GAIN & OFFSET.

#### Two Point Calibration - Telnet

Sending Field F2 [ **1<sup>ST</sup> point** ] on a 4-20mA input causes a response in command fields F2 & F6.

After prompting the user to change the input current to the 2nd point and to enter the corresponding value, send the IL command with fields F1,F2,F3 & F6.

The controller will calculate a new OFFSET & GAIN.

The browser prompts the user through the two steps, hiding the value of Field F6 from the user.

#### Field 4, Reset to Factory

Field F5 can be set to '1' at any time to reset a sensor to it's default OFFSET & GAIN

Water meters are reset to Volume/Contact = 100 or 'K' Factor = 100.

#### Field 5, Override

Forces single point calibration when either OFFSET or GAIN is outside of factory set limits.

Requires a Field 1 value.

Not applicable to two point calibrations.

## 3.2 OC: Output Configure

F0 F1 F2 F3 F4 F5 F6  
**OC [1..10] [ Control Eq'n ] [ Turn ON /Volume ] [Turn OFF / Time ] [ Interlocks ] [ Blocking Relays ]**  
 F7 F8 F9 F10 F11 F12  
**[ Type ] [Special Control ] [ SC-P1 ] [ SC-P2 ] [ SC-P3 ] [ SC-P4 ]**  
 F13 F14 F15  
**[ SC-P5 ] [ Variable Cycles ON 1/0] [Feed Verify ON 1/0]**

### Field 2: Control Equations

Reference command **IC** – Input Configure

**Input Types :** S: Sensor  
 M: Meter, Volume Measurement  
 C: Contact, Closed=ON

**Operators:** + Sum, - Difference, / Division, \*Multiply, : Sequence

Limited to four Inputs and three Operators.  
 Input Types cannot be combined in a Control Equation.

Relay Outputs 1..10: The first letter of a control equation must be a letter.  
 4-20mA Outputs 11..18: Single parameter control equation may be an input A..Z or relay 1..10.  
 Control Equations can be removed using the '!' character.

Relay Outputs 1..10 without a control equation are OFF unless turned ON by a timed event or pre-bleed.

4-20mA Outputs 11..18 without a control equation, in AUTO mode, are 4mA.  
 Interlocked 4-20mA outputs in both AUTO and MANUAL outputs are 4mA.

### Sequence

':' Sequence is limited to type M:Meter inputs. O:P, measures a volume on O and the turns ON until the turn OFF volume is measured on P. Sequence can be used for Water Meter Cycle Control and for Volumetric chemical feeds: Measure 100 Gallons, Feed 10mL.

### Type C:Contact Controls

Control Equations of Type C:Contact control on the ON time of the contact set in seconds. Turn ON Setpoint =30, turns ON the output relay , 30 seconds after the contact set closes. The Turn OFF Setpoint is ignored.

### Units and Resolution

The first Input letter of the Control Equation is used to provide the Output units and resolution, grouping within the Browser view and LCD Display sequencing.

### 4. XML – Telnet Commands

#### 4.1 XML

The **CL** command serves the controller data log defined by controllerhistory.dtd

#### 4.2 Telnet

##### 4.2.1 Overview:

Trackster currently uses Telnet to communicate with the LAN accessible Flex & AS series controllers using a comma delimited command syntax.

Users requiring data logging will use Trackster or a similar application, to acquire, save and display data log based reports. Similarly, users requiring modem access to a remote controller will use Trackster or an equivalent interface.

##### 4.2.2 Command Syntax:

Telnet based applications use the same syntax as encoded URL with the following modifications:

1. Commands fields are comma delimited with unused fields separated by sequential commas, eliminating the need to transmit the F0, F1... field numbers, hex encoding and '&' , '=' characters.
2. Current state information is acquired from the controller by sending the F0 field of the command. Some commands will also require the F1 field to identify a sensor or output.
3. Keypress, Alarm and similar lists are sent from the controller as a series of CR LF ( \r \n ) terminated strings. Components within each string are comma delimited.
4. A command which modifies fields receives a comma delimited response with the same syntax as the command on successful execution of the command, prefaced an optional status-error message line with first char = '!' as parsing support for your app.

For example if you wished to clear the alarm on input 'C' you would Telnet '**IA,C,,,,,1**' & the controller would respond:

```
! Alarm cleared          ( ! – optional state line )  
IA,C,10.45,5.68,30,1,0   ( current state )  
>>                       ( command prompt )
```

5. The controller indicates that a command has completed and that it's ready for the next command with a prompt '>>'
6. The command line parser ignores command lines that are CR LF only or start with '/', the 'C' comment delimiter, supporting white space and comments in SAVE-RESTORE configuration files.
7. Over running the command line buffer, clears the command line buffer.

##### 4.2.3 Save - Restore:

- Save:** Using two letter commands and saving the responses to a file details the current controller configuration. Sequencing through all I/O, stripping the error messages on disabled I/O simplifies the Save function.  
The Save text files are not cryptic & can be edited or limited to back-up or clone controllers, create generic controllers or to selectively upgrade the dial-out & HELP link.
- Restore:** The **AM** & **AC** commands support clearing the controller and transferring controller current state to FLASH.  
FLASH configurations are loaded on user request.  
Restore at the ADMIN level consists of a sequence of Telnet commands  
Followed by an **AC**, [Save Config] then an AC, [Full Reset] to define the power up state.

The Telnet parser ignores any line starting with '/' & blank lines, allowing headers and comments in text configuration files.



### 5. Telnet Tabular Data

#### 5.1 Table Structure

Commands which may have a tabular response: **AD / AI / AR / CK / CM / ID,[A..Z] / OD,[1..18]**

Respond with comma delimited tabular data with each row terminated with CR LF (\r\n).

The number of columns varies with the command from 3-5.

#### 5.2 Admin Diagnostic

Command: **AD**

not password protected

Item# ,	Descriptor ,	Data,	Notes
0	Serial number	TYYMCNNNN	1.
1	Firmware Version	0924-M7/M14-PR5/PR10	
2	AC Current	(6.94)	2.
3	Relay 1-5 fuse	OK/FAIL	3.
4	Relay 6-10 fuse	OK/FAIL	4.
5	Alarms	OPEN/CLOSED	5.
6	Relays Enabled	OK/FAIL	6.
7	Watchdog Resets	0	7.
8	Reset to Factory	Date & Time	
9	Admin Password	Changed / Default	8.
10	Internal 2.5V	(1.000238)	9.
11	15V External Supply	(17-22)	
12	12V Relay Supply	(12 +/- .5)	
13	Ethernet	YES/NO	10.
14	Feed Verify	YES/NO	10.

- Notes:
1. Serial Number TYYMCNNNN - T: Type Letter: 'M', YYM: Year & month of mfg,  
C: checksum NNNN:Batch Sequence#
  2. Reads 0 if current sensor not installed. Measures total current including the current required to power the controller. May log & display on 'G' if AM option set.
  3. If fuses FAIL, output relays will not power pumps and valves.
  4. Reads OK if relays 6-10 not installed
  5. Contact state, May be alarmed or not depending on **AA** command setting
  6. FAIL disables all Digital Inputs and Output relays.
  7. Any number greater than zero indicates that the controller has shutdown and automatically restarted. Check Setpoints, alarms and sensor levels.
  8. Verifies that **AU** command has reset admin password to default.
  9. Correction applied to reference so it reads 2500mV, 1.00 +/-0.02
  10. Firmware Option installed by manufacturer

### 5.3 Admin IDs

Command: AI

operator password

User# ,	Userid	Password	Notes
0	Public		1.
1	Admin		2,3.
2	Operator 1 userid		2.
3	Operator 2 userid		
4	Operator 3 userid		
5	Operator 4 userid		
6	Operator 5 userid	( Password 5 )	4.
7	Operator 6 userid		
8	Operator 7 userid		

Notes:

1. User# indexes users in the Communications Keypress (**CK** command) table. 'Public' user exists for activities which do not require a password.
2. Userid = Maximum 11 letters, case sensitive, Password= 8 letters & numbers only, limited for use with LCD keypad users, case sensitive. LCD-keyapd users are limited to capital letters A..Z and 0-9.
3. Userid = fixed, cannot be modified. Changing the 'admin' password is reflected by **AD** command
4. Only current user has Password in table.

### 5.4 Admin Reset Alarms

Command: AR

not password protected

Line	Descriptor ,	Date Time,	Activity	Notes
0	Tower pH	2003-04-10 14:12:18	High	1.
1	Acid Pump No.4	2003-04-10 12:32:56	Day Timeout	2.
2	Tower Cond	2003-04-08 04:36:18	Low	3.
3	Oxidant Valve	2003-04-08 02:09:10	ON Timeout	
4	Relay 6-10 Fuse	2003-04-08 00:05:00	Fuse opens	4.

Notes:

1. Lists all active, uncleared alarms OR 0,No Active Alarms,,,,
2. I/O point name followed by date & time logged and fault type.
3. Analog sensors only alarm after the user set Delay – see **IC** command
4. Fault types vary with I/O. Controller level alarms do not refer to a specific I/O. Descriptor is set to System:

### 5.5 Communications Keypress Log

Command: CK

not password protected

User ID,	I/O Descriptor ,	Date Time,	Activity,	Notes
4	Tower pH	2003-04-10 08:22:31	Adjust Alarms	1.
4	Acid Pump No.4	2003-04-10 08:20:05	Re-configure	
4	Tower pH	2003-04-10 08:10:16	Alarm Reset	
4	Acid Pump No.4	2003-04-11 08:10:14	Alarm Reset	
94	Tower pH	2003-04-10 14:12:18	Alarm High	2.
94	Acid Pump No.4	2003-04-10 12:32:56	Day Timeout	3.
94	Tower Cond	2003-04-08 04:36:18	ON Timeout	
94	Oxidant Valve	2003-04-08 02:09:10	ON Timeout	4.
94	Relay 1-5	2003-04-08 00:05:00	Fused	

Notes:

1. User ID indexes the **AI**, Admin ID table.
2. Log Items set by the controller have no User ID & are represented by '94',System
3. Text strings are limited to 17 so that LCD users will see identical messages.
5. If LCD passwords are not set (default) using the **AC** command , all keypad activities will be User ID = 0,'Public'

### 5.6 Input Diagnostic

Command: ID,[A..Z]

not password protected

Item# ,	Descriptor ,	Data,	Units	Notes
0,	Sensor Location	(F)	,	1.
1,	Input Card Type / Digital Input Type	( Corrosion Rate ) Water Meter / Contact Set	,	2,4
2,	Current State	Text	,	3
3,	Displayed Value / Volume Today / Time ON today	( 5236 )	,( uS )	4
4,	Period Maximum / Current Period	( 6298 )	,( uS )	
5,	Period Minimum / Volume this year	( 5062 )	,( uS )	5,7
6,	Period Average / Volume last year	( 5591 )	,	5,7
7,	Sample Size	( 630 )	,	5,6
8,	Current Period	( 21 )	,minutes	
9,	Log Period	( 60 )	,minutes	
10,	Compensation	( Thermal )	,	5,6
11,	Anodic Level	( 50.836 )	, mV	6,10
12,	Cathodic Level	( -48.432 )	, mV	6,10
13,	Pitting Level	( 1.23 )	, mV	6,10
14,	Measured Level	( 418.8 )	, mV	5,6
15,	Gain Multiplier	( 12.560 )	,	4,7
16,	Default Gain	( 12.500 )	,	5.6
17,	Offset Adjust	( -10.460 )	,uS	5,6
18,	Default Offset	( 0.000 )	,	5.6
19,	Input card ID	( 1712 )	, mV	8
20,	Drive level	( 74.6 )	, mV	9

- Notes:
1. Physical location of input A..Z.
  2. Driver card or user set type for digital inputs.
  3. Descriptive text string.
  4. Values vary with Type.
  5. With user set resolution, all times as minutes with 0.1 resolution.
  6. Skip on digital inputs.
  7. Skip on non-analog sensors.
  8. Check on card ID level – refer to Section 5.IC for design ID levels  
CT & B cards use the sensor drive as an ID Level. OP uses the sensor bipolar offset.
  9. Corrosion rate sensors only. Displays card offset mV
  10. Corrosion Rate Compensation only, skipped on all other sensors

## 5.7 Output Diagnostic

Command: OD,[1..18]

operator password

Item# ,	Descriptor ,	Data,	Value	Notes
0,	Current State	(Text string)	,	
1,	Control by:	(Control Eq'n)	(Control value)	1.
2,	Turn ON setpoint Measure Volume 4mA Level	(Value)	,	2.
3,	Turn OFF setpoint Then Turn ON for 20mA Level	(Value)	,	2.
4,	Last fed at	( Volume )	,	3.
5,	Control Type	( Type string )	,	
6,	(1/7/28) Day Event Cycle	(0-28) events,	Day (1-28)	
7,	minutes ON today	(Value)	Minutes	
8,	ON this actuation	(Value)	Minutes	
9,	Time owed	(Value)	Minutes	
10,	(Special Control Type) none Bleed & Feed Bleed then Feed Captured Sample  Percentage Time Prebleed-Lockout  Time Modulation  Holding Time Timed Cycling	(State)  ON/OFF (Bleed Relay) ON/OFF (Bleed Relay) State string  Countdown (sec) Prebleeding / Lockedout  ON / OFF  (# of Samples) ON / OFF	, , , Owed (sec) Countdown (sec) , Countdown (minutes) Countdown (sec) , Countdown (minutes)	
11,	Variable Cycles	(State)	,	4.
12,	Feed Verify	(State)	,	5.
13,	Fail-to-sample	ON/OFF	,	
14,	Output card @	('IO' type card location A..N) / I/O Card Removed	,	

- Notes:
1. This line suppressed if no control or 4-20mA output in manual mode.  
Control Value varies with control type, cycles for VC controls, seconds for Contact controls...
  2. Text varies with control type
  3. Either line 4 or 5 is sent.
  4. VC State: Offline / Low Range / Med. Range / High Range / Max Conduct.
  - 5.FV State: Offline / Fixed Cycles / Meter Cycles / Bleed Cycles  
inapplicable lines suppressed.

### 5.8 Output Events

Command: OE,[1..10] enter

operator password

Event#	Start Day ,	Start Hours,	Start Minutes,	Run Time (minutes)
0,	2,	4,	0,	240
1,	9,	14,	30,	60
2,	16,	4,	0,	240
3,	23,	14,	30,	60

#### Notes:

1. Lists up to 28 events, 0..27 per relay.
2. Day 0 = Sunday unless Day Event Cycle =1, in which case Start Day is always the current day,0.
3. If no events exist, controller returns prompt '>>'