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I28 COMMUNICATIONS INTERFACE

Purpose: *The setup and operation of the Sentinel I28 communication options are explained in detail in the I28 operation manual. The Sentinel I28 communicates via RS232 and Telnet and provides information storage onto a USB flash drive. This application bulletin will explain some of the communication considerations for these different methods.*

There are two (9 pin connector) RS232 terminations, and one Telnet jack located on the connector panel on the left side of the instrument. The USB port is located on the front of the instrument. See Figure 1.
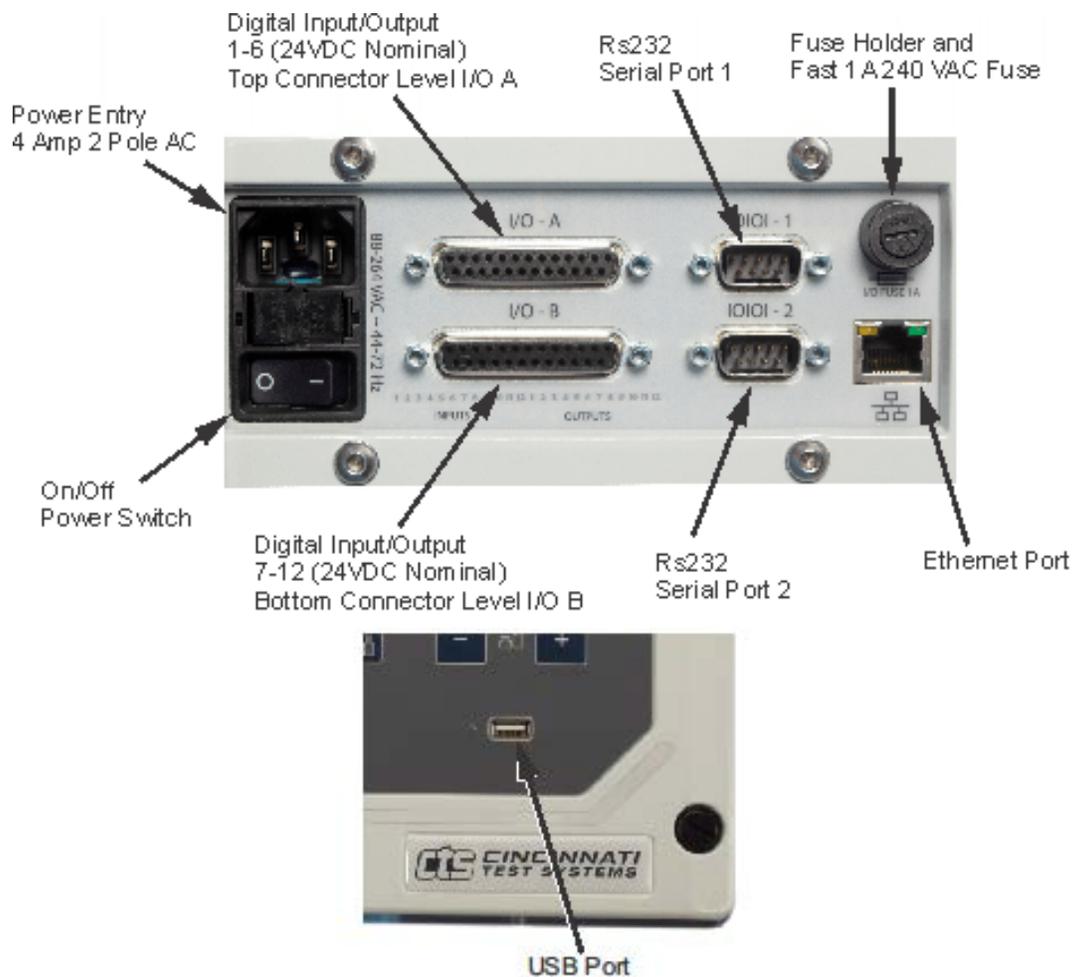

Figure 1: Telnet, RS232, and USB Terminals

Communication with Other Serial Devices

The Sentinel I28 instrument has the ability to communicate with other printers or compatible devices (such as computers or PLCs). Communication either can be with the instrument sending information on command using the menus under the instrument's Global Config screen or with an external device programmed to request specific information.
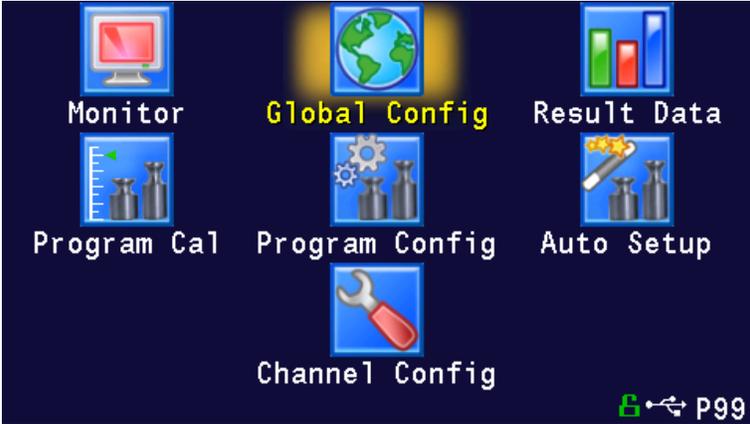

Figure 2: Main Menu Display Screen

Communication Setup and Execution

The Sentinel I28 instrument communicates via Telnet (Ethernet) and RS232. This communication is two-way with each method. The USB flash drive can upload firmware updates to the instrument or used to store test results. There are common interface commands established to communicate with the instrument via the three methods. These commands can remotely request selected data, send new setup parameters for storage, and change some instrument functions. Common communication includes: instrument setup parameters, station setup parameters, part program parameters, calibration data, counter data, test result data, and security setup.

Figure 3: Global Config Menu

The setup and operation commands for communications to and from the Sentinel I28 are accessed via the Global Config menu choices. For serial communication, the operator must

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select RS232 1 or RS232 2. For communication via Telnet, the operator or computer must select the Telnet connection available through the one port. All of the communication channels can operate simultaneously.

For Telnet communication, the instrument must have an IP address.   Enter the information regarding Gateway/Router, Subnet Mask, and instrument IP address or obtain an IP address by setting the "Obtain network address" to "DHCP" within Global Config menu choices.

>   *Note: The instrument power must be cycled if an IP address is changed.*

There are several communication and terminal parameters that must be setup within your computer to enable communication with the Sentinel I28 instrument. PCs with operating systems prior to Windows 7 have standard communication software called HyperTerminal found under START/ Accessories/ Communications. For PCs with later versions, you will need to use HyperTerminal Private Edition (HTPE) or Tera Term, both are readily found free downloads.

>   *Note: The instructions in this document use standard HyperTerminal screens commands which may vary slightly from HTPE or Tera Term.*

The Sentinel I28 communicates in two ways. It can output a number of standard reports via the RS232 or Telnet. See Figure 4 below for a list of available report selections. Review the instrument User Manual, Chapter 4 on how to select these reports.

Report Selection	Description
Instrument Config	Setup Information for Hardware, Communication, Firmware, Instrument name, Time, Date, and Security
Station Config	Information about the manifold, transducer, and regulator
Part Config	Part setup parameters for all part programs,
Autosetup info	Initial parameters provided in the AutoSetup routine
All part results*	All the test results for the active part program in the instrument memory
All results*	All the test results in the instrument memory
Last 1000*	1000 most recent test results,
Last 100*	100 most recent test results,
Last 20*	20 most recent test results,
Station Counters	Counters information,

> * For part programs with dual tests the Sentinel I28 stores two test results for each part tested. Therefore, when 1000 parts are tested, 2000 test results are stored for output. If "Last 1000" is selected, it will output the dual test results for the last 1000 parts. "Each Test" will output the two test results for each part after it is tested

Figure 4:   Communication Reports or Functions

The test report output format for Last 20, 100, 1000, All Part Results, and All Results are set for either Space delimited or Fixed Width output.

Setup for "HyperTerminal" within Microsoft Windows 98 or higher

When transferring data from the Sentinel I28 instrument to a computer with Windows 98 or higher:

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1. Connect **null-modem** cable to the com port of the computer from external RS232 connection or connect an ethernet cable via a hub

2. Start Windows 98 or higher.

3. Choose START, PROGRAMS, Accessories, Communication, and HyperTerminal.

4. Choose HyperTerminal icon

5. Enter a connection name such as "I28 – RS232" or "I28 Ethernet" and choose desired icon, OK.

6. Within "Connect to" window, set "Connect using" to the com port for your computer, like "com 3" or select "TELNET" for Ethernet connection. For Telnet connections enter instrument's IP address and Port Number 23.

7. When communicating with the instrument via RS232, HyperTerminal can be configured to work with the following options. After setting the instrument configuration, set up Hyper-Terminal to communicate with the same parameters found under "Configure" below the "Connect using" window on the screen similar to Figure 5 when "Com 2" or "Com 3" is selected.
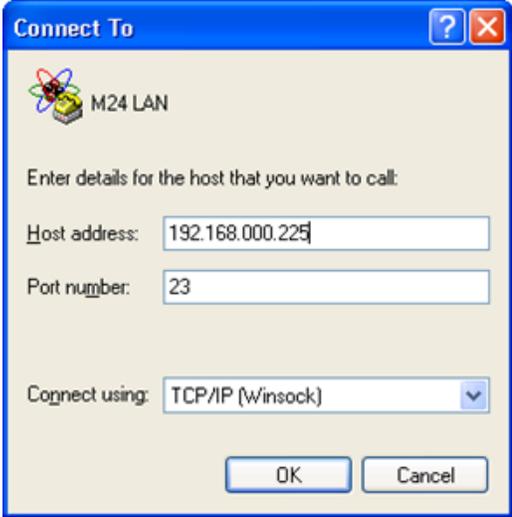
Figure 5: "Connect To" Screen

Data input field	**RS232**
Connect Using	COM3 (or other COM)
Bits per second	9600 or 115200 baud
Parity	No parity
Data bits	8 bits
Stop bits	1 stop bit
Flow control	none

Figure 6: RS232 Configuration Settings
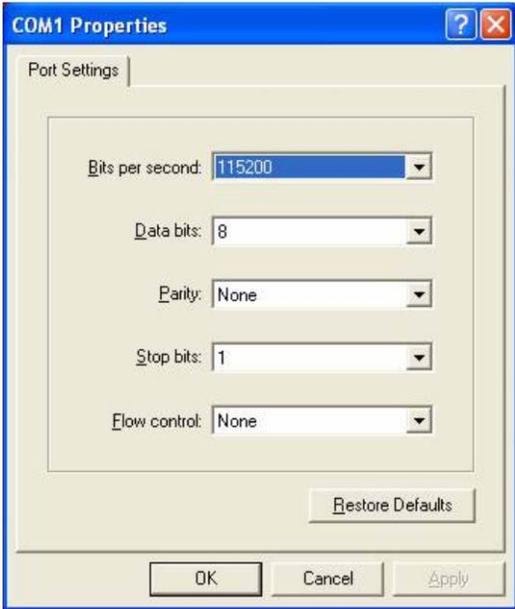
Figure 7: Com Port Serial Communication Properties

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Configuration Settings for Serial Communication (example of Windows XP)

These settings should match the Configuration setting within Global Config for the serial device (RS232).

    1. For RS-232 or Telnet, choose File, Properties, Settings.
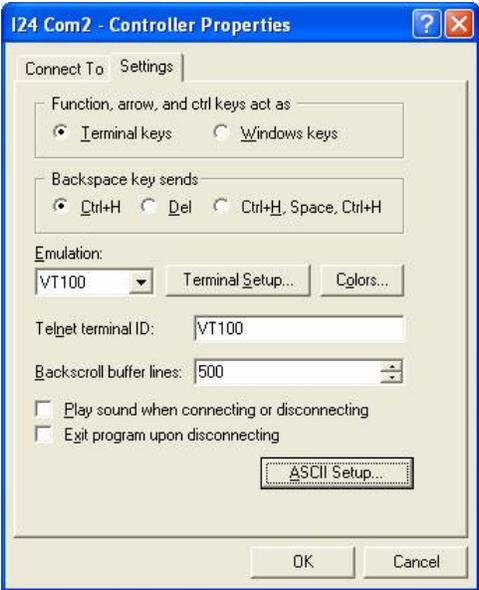
Figure 8: HyperTerminal Controller Properties Screen

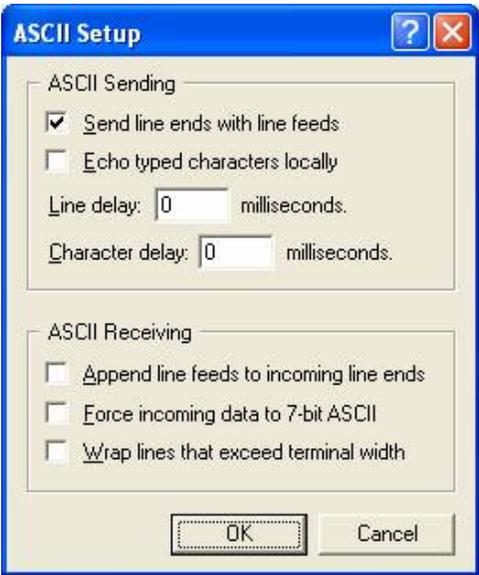   2. Click on the button "ASCII Setup"

Figure 9: ASCII Settings Screen

When using HyperTerminal as an ASCII terminal, the following settings need to be set in HyperTerminal or the communication software as "properties" to receive and display data:

1. Choose File, Save As, Save.

2. The HyperTerminal is ready to receive data from the Sentinel I28 instrument now and in the future.

3. For future data transfers, the computer will have a dedicated icon on HyperTerminal setup to receive data.

4. On the Sentinel I28, select Global Config, choose "RS232" or "TELNET" as the port option, and select the desired output by the adjusting the settings for Interface, Function and Output for either RS232 or the Telnet outputs. Press Enter.

    Note: *Make sure that the Sentinel I28 and receiving device are set the same. The data transfer is initiated when Enter is pressed.*

5. The data can be transferred directly to a file that can be opened in a spreadsheet program like Excel. Click on "Transfer" in the upper tool bar of HyperTerminal. Chose "Capture Text" and define a file name where the data should be sent. Click on "Start" in the transfer window.

6. When the data transfer is complete, click on "Transfer" and "Stop".

7. Open the spreadsheet program. Open the txt.file where the data was stored and saved using spreadsheet software like Excel.

8. While opening the "txt" file into Excel, check "Delimited". Check "Space", "comma" and "tab" and then Next and Finish.

9. Most data can also be copied from HyperTerminal and pasted into Excel. After pasting into Excel, highlight the data and select Data, Text to Columns, Delimited, Space, comma, NEXT, and FINISH. There is a limitation on width of the data line in HyperTerminal that may cause the data to wrap to another line and get sorted to the wrong columns.

10. Remember the test result files have the most recent results at the top or first.

Sending Information One-Way via Commands though Sentinel I28 Communication Screens within Global Config Functions

When the instrument is setup to communicate with RS232 or Telnet, the operator can command the instrument to send out any desired information via the Global Config menu choices. The operator chooses the desired report from the communication options defined by the combined settings of Interface, Function, and Output within the "RS232" or "TELNET". After entering the desired choice, the information is sent to the computer that is connected for the transfer. Full details about requesting the reports through the keypad for these communication options are described in the I28 User Manual, Chapter 4.

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Requesting Information to be Sent using Two-Way Communication via Remote Commands Using One of the Communication Options

A remote computer can request information from the Sentinel I28 via the two-way communication capabilities. Sending the desired alpha-numeric character string outlined below will either:

- Request test results, part or instrument setup information, or counter information.
- Download changes to stored part or instrument setup information. .

1. Enter HyperTerminal and connect with the Sentinel I28 instrument via Telnet. The display will indicate that a connection is made.

2. Type "help" (return) and the following will display on the computer screen when the proper connection is made with the Sentinel I28 instrument. See Figure 10.

```
help
************************************************************************
* TREE ROOT                   CONTROLLER                    *
************************************************************************
*  <I>: Instrument config                              *
* <P#>: Part config menu (please select a part number)             *
* <T#>: Test data (please select a part number)              *
* <S#>: Self test (please select a part number)             *
* <A#>: Autosetup                             *
*  <M>: Module menu                           *
*  <U>: Update Firmware                          *
*  VER: Display Version Number                     *
*  Dir: Display Current Branch                    *
* Help: Help                             *
-------------------------------------------------------------------
```

Figure 10: Tree Root Menu for the Sentinel I28

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3. To address a particular menu, type the letter within < >, and Return or Enter. The submenu for that letter will be sent.

   For instance, to find out about the Part Configuration for part 01, type "p01", Enter.

```
p01
■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■
*   Part Configuration
***************************************************************************
* <X>:  Tst type, Test description for this part.              *
* <R>:  Timers, Test timer settings for this part.             *
* <P>:  Pressure, Pressure settings for this part             *
* <S1>: tst                                        *
* <C1>: cal                                       *
* <M>:  misc                                     *
* <U>:  units                                     *
* <I>:  inputs                                    *
* <O>:  outputs                                    *
* <T>:  tooling                                   *
*  VER: Display Version Number                           *
*  Dir: Display Current Branch                         *
* Help: Help                                    *
***************************************************************************
```

Figure 11: Part Configuration Menu Output.

4. To find out the settings for the Timers, type "r", Enter.

```
r
***************************************************************************
*   Timers, Test timer settings for this part.              *
***************************************************************************
* <1B0>: Prefill          0.15 sec               *
* <230>: Fill            0.60 sec               *
* <320>: Stabilize        6.55 sec              *
* <420>: Test           1.45 sec              *
* <5F0>: Exhaust          0.15 sec             *
* <8D0>: Relax           11.85 sec             *
*  VER: Display Version Number                     *
*  Dir: Display Current Branch                   *
* Help: Help                          *
***************************************************************************
```

Figure 12:   Part Configuration, Timers Menu Output

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5. If you have entered into the Part Configure menu via the commands just discussed, you can change a timer by using the following command. The command involves entering the variable character found within < > and the new value for the variable. For instance:

    1B0 = 0.5   would change the pre-fill timer to 0.5 seconds

The direct way to change that one variable while in the original screen after entering the connection would be:

    P01R1B0=0.5

This directs the change to Part Program 01 (P01), Timer value (R), Pre-fill timer (1B0).

6. To determine the correct variable code, you should enter into HyperTerminal and determine the correct codes for the variables desired. The main Tree Root codes are:

TREE ROOT	
TREE ROOT Code	**Description**
I	Instrument Configuration
P#	Part Configuration menu (specify with part number)
T#	Test data (specify with part number)
S#	Self Test (specify with part number)
A#	Auto Setup (specify with part number)
	Module menu
	Update Firmware
VER	Display Version Number
Dir	Display Current Branch
Help	Help

Figure 13: Tree Root Code Identification

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See the list of configuration and menu codes for Instrument Configuration below.

TREE ROOT	Config Code	Menu Code	Description
Instrument Configuration			
I			Instrument Configuration
	H		Hardware, Instrument Hardware Settings
		530	Manifold Type
		7B0	Number of Parts
		541	Transducer Type 1
		671	Regulator type 1
	S		RS232 Port 1 Front door
		I	RS232 Port 1 Interface
		C	RS232 Port 1 Configuration
		F	RS232 Port 1 Function
		S	RS232 Port 1 Output
	T		Instrument Networking Settings
		4	Obtain network settings
		IP	Instrument IP address
		M	Mail Server IP address
		G	Gateway IP address
		S	Subnet Mask
		C	MAC address
	1		TELNET 1
		I	TELNET 1 Interface
		F	TELNET 1 Function
		S	TELNET 1 Output
	U		USB Universal Serial Bus Settings
		P	Update firmware
		M	Drive control
	E		Email, Instrument email settings
		I	User id
		P	Email Password
		R	From Address
		F	Email Function
		AF	Email Function address
	M		Misc, General instrument settings
		IN	Instrument name
		S	Serial number
		C	Edit/View security
		T	Time
		D	Date

Figure 14:   Instrument Configuration Menu Codes

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7. To request a download of test data independent of what is requested through the keypad of the instrument, enter codes as though you were going through the keypad to request the output. For instance to output the last 1000 test results via Telnet 1, you would enter a string of characters going from the Tree Root through the menu code.

Type "I", Enter   for Instrument Configure

Type "1", Enter   for Telnet 1

Type "F>" Enter   to determine the code for "Sta Last 100"

The instrument will feed back all the codes for Function (F). From this list it will be determined that the code for "Sta Last 100" is 3.

Type F=3, Enter

The instrument will output 100 test results via Telnet 1.

The configuration codes for Part Configuration are listed below.

TREE ROOT	Conf Code	Menu Code	Part Configuration
P#			Part Configuration information for part number #
	X		Test type
	R		Timers
	P		Pressures
	S1		Test Parameters, 1st test
	C1		Calibration Parameters, 1st test
	M		Miscellaneous
	U		Units of measurement
	I		Inputs
	O		Outputs
	T		Tooling configuration

Figure 15: Part Configuration Codes

8. The menu codes vary by test type within Part Config. If you want to change or define the part configuration values via an RS232 or Telnet, input P# and Enter and the Configuration code and Enter. The menu codes within the Configuration code will output with their identification. Use these menu codes to enter new values using the format described above.

Note: *To back out from a menu, Type "exit" to escape back to the Tree Root menu.*

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9. To determine the available choices within a Menu, type the menu code and >. For instance to determine the available choices for Manifold type within Hardware:

> Exit, return
>
> I, return
>
> H, return
>
> 530>, return
> Or type   IH530>, return
> and the list of manifold options will appear.

10. To request reports from the Sentinel I28 via RS232 or a Telnet connection using Hyper-Terminal, the path to the reports is similar to using the keypad to find the menu where the desired output is selected. So to output the Last 20 test results (Function selection) in Fixed Width format (Interface selection) with All the Test Results (Output selection), you need to find the Instr Config functions on Telnet or RS232 communication.

So from the Tree Root menu, type "I", return.

```
*************************************************************************
*  Instrument Configuration                              *
*************************************************************************
* <H>:  Hardware, Instrument hardware settings.                *
* <S>:  Rs232 1, Front door comm port interface.             *
* <R>:  Rs232 2, On board comm interface.                  *
* <T>:  TELNET, Instrument networking settings              *
* <1>:  TELNET 1, User defined Telnet interface.            *
* <U>:  USB, Universal Serial Bus settings.              *
* <E>:  Email, Instrument email settings.              *
* <M>:  Misc, General intrument settings.              *
* <V>:  Version, Detailed instrument version settings.          *
*  VER: Display Version Number                    *
*  Dir: Display Current Branch                  *
* Help: Help                        *
*************************************************************************
```

Figure 16: Instrument Configuration Menu on HyperTerminal

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11. To communicate with TELNET 1, type "1", return.

```
***************************************************************************
*  TELNET 1, User defined TELNET interface.                      *
***************************************************************************
*   <I>: TELNET 1 Interface     Fixed width out              *
*   <F>: TELNET 1 Function      Sta Last 20                 *
*   <P>: Fixed width out        Part result only          *
*  VER: Display Version Number                           *
*  Dir: Display Current Branch                          *
* Help: Help                                        *
***************************************************************************
```

Figure 17: TELNET 1 Menu Displayed on HyperTerminal

12. To get the right format output make sure that "Interface" is set for "Fixed width out", "Function" is set for "Sta Last 20", and "Fixed Width out" is set for "All result information". The above display showing the current settings for our desired output is not quite right. We need to change the "Fixed width out". If we do not know the code for the desired output, we can enter an inquiry command to list the available code and outputs.

13. Type the letter code in the < > follow by an ">". Therefore to find the options for the "Fixed Width out" output options, type   P> and Enter

```
L01: 1,3  A> All result information :01:AD
L01: 2,3  2> First 2 test results :02:82
L01: 3,3  P> Part result only :03:06
L01: 4,4  C> Custom :08:1F
```

Figure 18: Output options for Fixed Width Interface

14. To change the Output option to "All result information" which is selection A for the options above. type   P=A.

```
V01: I1P=All result information :04:7C
```

Figure 19: Response to Output change

15. Now test results will be sent after each test by the instrument in the "All result Information" format.   To download the last 20 results, find the code for "Sta Last 20". Type F>, Enter.

```
L01: 1,10  C> Station Cntrs :07:AD
L01: 2,10  1> Sta Last 20 :08:9C
L01: 3,10  2> Sta Last 100 :09:69
L01: 4,10  3> Sta Last 1000 :0A:22
L01: 5,10  4> All results :0B:A4
L01: 6,10  5> All part res :0C:A0
L01: 7,10  I> Instr Config :0D:25
L01: 8,10  S> Station Config :0E:2E
L01: 9,10  P> Part Config :0F:00
L01: 10,10  A> Autosetup info :10:93
```

Figure 20: Response to Request for Function selections.

16. To request the "Sta Last 20" results.of All result information, type F=1, enter.

```
S01 P01 R-- 01/10/08 04:23:59.020 0000387755 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132648 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136364 psig
S01 P01 R-- 01/10/08 04:23:58.230 0000387754 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132481 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136434 psig
S01 P01 R-- 01/10/08 04:23:57.440 0000387753 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132606 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136485 psig
S01 P01 R-- 01/10/08 04:23:56.650 0000387752 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132839 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136443 psig
S01 P01 R-- 01/10/08 04:23:55.880 0000387751 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132779 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136397 psig
S01 P01 R-- 01/10/08 04:23:55.090 0000387750 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132788 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136318 psig
S01 P01 R-- 01/10/08 04:23:54.290 0000387749 A  -            No barcode
 PLR   P  LR 0.000000 sccm     PL 0.000000 dpsig     PT 0.132541 psig     EDC 0.
000000 sccm     PQ 0.000000 sccm     QL 0.000000 dpsig     QP 0.136229 psig
```

Figure 21: Portion of the "Sta Last 20" Test Result All Result Information Output on Hyper-Terminal