



The ! Voice



VST Mission

To design and manufacture innovative products for retail refueling systems that are specifically engineered to protect the environment and consumers with safety and reliability.

Short Cuts - Web Links - Equations

Doug Harty, Sr. Application Engineer { harty@vsthose.com }



Back in my service technician days, I learned from experience that you're bound to encounter similar field and equipment issues most every day. To avoid the tedious process of hunting down information, I created a quick reference guide for myself that I put in a sturdy binder along with my certifications. I've faithfully carried that trusty binder in my service truck, and for sure, I've used most every day since the day I created it!

Over the years, I've added many helpful notes as I encountered new situations or learned new things, so I thought I'd make a printable cheat sheet with some of the most common conversions, formulas, tables, and web links to share with you.

I plan on continuing to improve and update these notes as I learn more. I'd love any ideas and feedback you may have that would make these notes even better!

The following pages contain helpful information for these 8 topics:

1. AQ Testing Limit
2. Calculations, Common
3. Conversions, Common
4. Pressure Decay Criteria: Phase II Assist Systems
5. Pressure Decay Criteria: Phase II Balance Systems
6. TLS-350 Command Codes: ISD
7. TLS-350 Command Codes: Testing & Alarm History
8. Web Resources



VST Values

R: Respect
Employees,
Customers, Vendors,
and Environment

O: Operational
Excellence, Quality,
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I: Innovative Passion,
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VST strives to become the most trusted company in the global gasoline dispensing industry by manufacturing environmentally sustainable products and solutions that reduce harmful vapor emissions to create a future that protects the communities in which people live and work every day.





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1. AQ Testing Limit

- Dynamic Backpressure - Balance - Nozzle to UST
- 60 CFH of N2 \leq 0.35 inches H2O
- 80 CFH of N2 \leq 0.62 inches H2O
- Dynamic Backpressure - Assist – Vapor riser to UST
60 CFH of N2 \leq 0.05 inches H2O

2. Calculations: Common:

Flow Rate:	(Gallons/Seconds) x 60
Liquid Removal Rate:	$\frac{(\text{Initial volume}-\text{Wall Adhesion}) - \text{Liquid remaining}}{\text{Gallons}}$
Vapor / Liquid:	$\frac{\text{Correction Factor} (\text{End Cubic Feet} - \text{Start Cubic Feet})}{(\text{Gallon Final}-\text{Gallon Start}) \times 7.481}$

3. Conversions: Common:

Gallons to Cubic feet:	1 cubic foot = 7.481 gallons
CFH to ml/min :	1 CFH = 471.95 ml/min



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4. Pressure Decay Criteria: Phase II Assist Systems



TABLE 1B
PHASE II ASSIST SYSTEMS
PRESSURE DECAY CRITERIA
INITIAL PRESSURE OF 2 INCHES WATER COLUMN (WC)
MINIMUM PRESSURE AFTER 5 MINUTES, INCHES WC

ULLAGE, GALLONS	NUMBER OF AFFECTED NOZZLES				
	01-06	07-12	13-18	19-24	≥24
500	0.73	0.69	0.65	0.61	0.57
550	0.80	0.76	0.72	0.68	0.64
600	0.87	0.82	0.78	0.74	0.71
650	0.93	0.88	0.84	0.80	0.77
700	0.98	0.94	0.90	0.86	0.82
750	1.03	0.98	0.94	0.91	0.87
800	1.07	1.03	0.99	0.95	0.92
850	1.11	1.07	1.03	1.00	0.96
900	1.15	1.11	1.07	1.03	1.00
950	1.18	1.14	1.11	1.07	1.04
1,000	1.21	1.18	1.14	1.10	1.07
1,200	1.32	1.28	1.25	1.22	1.19
1,400	1.40	1.37	1.34	1.31	1.28
1,600	1.46	1.43	1.41	1.38	1.35
1,800	1.51	1.49	1.46	1.44	1.41
2,000	1.56	1.53	1.51	1.49	1.46
2,200	1.59	1.57	1.55	1.53	1.51
2,400	1.62	1.60	1.58	1.56	1.54
2,600	1.65	1.63	1.61	1.59	1.57
2,800	1.67	1.65	1.64	1.62	1.60
3,000	1.69	1.68	1.66	1.64	1.62
3,500	1.73	1.72	1.70	1.69	1.67
4,000	1.76	1.75	1.74	1.72	1.71
4,500	1.79	1.78	1.77	1.75	1.74
5,000	1.81	1.80	1.79	1.78	1.77
6,000	1.84	1.83	1.82	1.81	1.80
7,000	1.86	1.85	1.85	1.84	1.83
8,000	1.88	1.87	1.86	1.86	1.85
9,000	1.89	1.89	1.88	1.87	1.87
10,000	1.90	1.90	1.89	1.88	1.88
15,000	1.93	1.93	1.93	1.92	1.92
20,000	1.95	1.95	1.94	1.94	1.94
25,000	1.96	1.96	1.96	1.95	1.95

Note: For manifolded Phase II Assist Systems, the "Number of Affected Nozzles" shall be the total of all gasoline nozzles. For dedicated return configurations, the "Number of Affected Nozzles" shall be the total of those nozzles served by the tank being tested.



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5. Pressure Decay Criteria: Phase II Balance Systems



TABLE 1A
PHASE II BALANCE SYSTEMS
PRESSURE DECAY CRITERIA
INITIAL PRESSURE OF 2 INCHES WATER COLUMN (WC)
MINIMUM PRESSURE AFTER 5 MINUTES, INCHES WC

ULLAGE, GALLONS	NUMBER OF AFFECTED NOZZLES				
	01-06	07-12	13-18	19-24	>24
500	0.44	0.41	0.38	0.36	0.34
550	0.50	0.47	0.45	0.42	0.40
600	0.56	0.53	0.51	0.48	0.46
650	0.62	0.59	0.56	0.54	0.51
700	0.67	0.64	0.62	0.59	0.56
750	0.73	0.70	0.67	0.64	0.61
800	0.77	0.74	0.71	0.69	0.66
850	0.82	0.79	0.76	0.73	0.70
900	0.86	0.83	0.80	0.77	0.75
950	0.90	0.87	0.84	0.81	0.79
1,000	0.93	0.91	0.88	0.85	0.82
1,200	1.06	1.03	1.01	0.98	0.95
1,400	1.16	1.14	1.11	1.09	1.06
1,600	1.24	1.22	1.19	1.17	1.15
1,800	1.31	1.29	1.27	1.24	1.22
2,000	1.37	1.35	1.32	1.30	1.28
2,200	1.42	1.40	1.38	1.36	1.34
2,400	1.46	1.44	1.42	1.40	1.38
2,600	1.49	1.47	1.46	1.44	1.42
2,800	1.52	1.51	1.49	1.47	1.46
3,000	1.55	1.54	1.52	1.50	1.49
3,500	1.61	1.59	1.58	1.57	1.55
4,000	1.65	1.64	1.63	1.61	1.60
4,500	1.69	1.68	1.67	1.65	1.64
5,000	1.72	1.71	1.70	1.69	1.67
6,000	1.76	1.75	1.74	1.73	1.72
7,000	1.79	1.79	1.78	1.77	1.76
8,000	1.82	1.81	1.80	1.80	1.79
9,000	1.84	1.83	1.83	1.82	1.81
10,000	1.85	1.85	1.84	1.84	1.83
15,000	1.90	1.90	1.89	1.89	1.89
20,000	1.93	1.91	1.92	1.92	1.91
25,000	1.94	1.94	1.94	1.93	1.93

Note: For manifolded Phase II Balance Systems, the "Number of Affected Nozzles" shall be the total of all gasoline nozzles. For dedicated return configurations, the "Number of Affected Nozzles" shall be the total of those nozzles served by the tank being tested.



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6. TLS-350 Command Codes: ISD



[CNTRL-A]IV0200yyyymm	ISD Monthly Status Report
[CNTRL-A]IV0300YYYYMMDD	ISD Daily Status Report
[CNTRL-A]IV0400yyyymm	ISD Daily Report Details (by month)
[CNTRL-A]IV0500ddd	ISD Daily Report Details (by day(s))
[CNTRL-A]IV0600yyyymm	ISD Daily Report Details, 132 columns (by month)
[CNTRL-A]IV0700ddd	ISD Daily Report Details (by day(s))
[CNTRL-A]IV0800yyyymmCCC	ISD Daily Report Details (by month) CCC=Columns
[CNTRL-A]IV0900dddCCC	ISD Daily Report Details, user input columns (by day(s))
[CNTRL-A]IV1200nnn	Vapor Collection Test Results # OF RECORDS
[CNTRL-A]IV8100	Percent Hydrocarbon Report
[CNTRL-A]IV8200	Vapor Processor Status Report
[CNTRL-A]IV8500yyyyymmddnnnn	PMC Daily Vapor Polisher Diagnostic

Flow Meter Operability/Query

[CNTRL-A]IV8700	Current Flow meter position BALANCE
[CNTRL-A]&18XX09950005	Last 5 Transactions – Assist XX=AFM Pos



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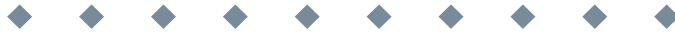




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7. TLS-350 Command Codes: Testing & Alarm History



System Reports

<CTRL-A> <I> 10100	System Status Report
<CTRL-A> <I> 10200	System Configuration Report (modules installed)
<CTRL-A> <I> 11100	Priority Alarm History Report
<CTRL-A> <I> 11200	Non-Priority Alarm History Report
<CTRL-A> <I> 12100	Active Alarm Report

In-Tank Reports

<CTRL-A> <I> 20100	In-Tank Inventory Report
<CTRL-A> <I> 20200	In-Tank Delivery Report
<CTRL-A> <I> 20300	In-Tank Leak Detect Report
<CTRL-A> <I> 20600	In-Tank Alarm History Report
<CTRL-A> <I> 20700	In-Tank Leak Test History Report
<CTRL-A> <I> 25100	CSLD Results Report

In-Tank Set-up Reports

<CTRL-A> <I> 60500	4-Point Volumes
<CTRL-A> <I> 60900	Thermal Coefficients
<CTRL-A> <I> 61200	Manifold Partners

CSLD Diagnostics

<CTRL-A> <I> A5100	Rate Table
<CTRL-A> <I> A5200	Rate Test
<CTRL-A> <I> A5300	Volume History Table
<CTRL-A> <I> A5400	Moving Average Table
<CTRL-A> <I> A5500	Leak Test Status
<CTRL-A> 980	SOFTWARE VERSION



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8. Web Resources

CCR Title 23	https://www.waterboards.ca.gov/ust/regulatory/docs/CCR_Ch16_10_2018.pdf
CFR 40 UST rules	https://www.ecfr.gov/current/title-40
Tank Charts	https://www.unidocs.org/hazmat/ust/installation/tankcharts.html
Designated Operator	https://www.unidocs.org/master_list.html#ust_dustop
Leak/Spill reporting	https://www.unidocs.org/master_list.html#un028
Testing Forms	https://www.unidocs.org/master_list.html#ust_testing
Unit Conversions	https://www.onlineconversion.com/



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