Scope:

Quantify changes in probe-to-socket insertion and retention forces for multiple installations of new probes into the same socket. Where applicable, measure the effect of changing to oversized (Factron) probe tubes.

Summary:

The following Sockets and Probes were randomly pulled from stock for this evaluation. These specific socket types were selected to provide a good cross section of QA's products.

Sockets	Lot No.	Probes	Lot No.
100-SDN250W	4220	100-PRP2503H	4214
100-SDN250W-H	4187	100-PRF2503S	4164
075-SDN250W	4208	075-PRP2503H	4213
050-SRB255P	4209	050-PRP2503H	4087

- Ten random sockets of each type were selected and the forces to insert and remove ten new probes in each socket were measured and recorded. On the .100 inch centers sockets, after the tenth set of measurements, five additional oversized probes (QA "F" tubes for Factron replacement) were installed and the forces measured and recorded.
- The insertion/retention force data was compiled and the average, minimum and maximum forces for each installation/removal were calculated. (Ref Tables 1 & 2)
- The forces for each socket type are also shown in graphs to best show the effect of the multiple probe insertions and the effect of changing to the Factron Probe. (Ref Graphs 1 - 8)

Conclusions:

- The force to insert a probe into all of the four socket types evaluated showed a drop for the first 3 - 4 insertions, after which time the forces stabilized.
- The change from a standard probe to an oversized (Factron) probe in a used socket caused a significant increase in insertion force which also dropped off after multiple insertions.
- The "-H" Socket (high force probe retention indent) had the highest insertion & retention forces and was least affected by multiple insertions.
- Probe retention forces showed a slight drop with multiple insertions and a slight increase with a change to the oversized (Factron) probe.

100-SDN250W Probe Insertion															
Skt	*Insertion Number*														
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	2.80	1.30	1.15	1.30	1.10	1.30	1.10	1.05	1.15	1.25	1.90	1.30	1.30	1.50	1.20
2	2.80	1.70	1.60	1.35	1.15	1.15	1.05	1.15	1.10	0.90	1.60	1.50	1.60	1.50	1.30
3	3.05	1.55	1.60	1.10	1.25	1.15	1.30	1.20	1.20	1.35	2.00	1.40	1.20	1.20	1.10
4	2.70	1.45	1.25	1.40	1.25	1.25	1.10	1.10	1.25	1.35	1.80	1.30	1.60	1.10	1.15
5	2.55	1.75	1.40	1.25	1.25	1.45	1.20	1.20	1.25	1.25	1.75	1.85	1.55	1.40	1.50
6	2.45	1.45	1.20	1.25	1.40	1.25	1.35	1.25	1.25	1.20	1.75	1.30	1.15	1.20	1.05
7	2.90	1.80	1.75	1.60	1.65	1.55	1.35	1.60	1.35	1.30	3.15	1.80	1.75	1.40	1.40
8	2.80	1.65	1.65	1.65	1.25	1.30	1.40	1.10	1.30	1.20	1.70	1.55	1.20	1.55	1.25
9	2.75	1.45	1.40	1.20	1.20	1.15	1.15	1.35	1.30	1.20	2.10	1.60	1.45	1.35	1.15
10	2.45	1.90	1.50	1.50	1.45	1.25	1.45	1.15	1.15	1.25	1.95	1.35	1.55	1.55	1.15
Avg	**2.73**	**1.60**	**1.45**	**1.36**	**1.30**	**1.28**	**1.25**	**1.22**	**1.23**	**1.23**	**1.97**	**1.50**	**1.44**	**1.38**	**1.23**
Min	2.45	1.30	1.15	1.10	1.10	1.15	1.05	1.05	1.10	0.90	1.60	1.30	1.15	1.10	1.05
Max	3.05	1.90	1.75	1.65	1.65	1.55	1.45	1.60	1.35	1.35	3.15	1.80	1.75	1.55	1.50

100-SDN250W Probe Retention															
Skt	*Insertion Number*														
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	1.70	1.75	1.50	1.60	1.50	1.65	1.35	1.35	1.45	1.50	1.45	1.85	1.30	1.10	1.40
2	1.55	1.75	1.65	1.55	1.40	1.50	1.20	1.30	1.45	1.35	1.50	1.45	1.40	1.30	1.30
3	1.70	1.75	2.20	1.80	1.50	1.45	2.00	1.20	1.40	1.50	1.45	1.45	1.35	1.10	1.65
4	1.60	1.85	1.40	1.80	1.35	1.55	1.25	1.15	1.35	1.45	1.70	1.25	1.50	1.60	1.25
5	1.70	2.05	1.60	1.40	1.95	2.15	1.35	1.35	1.35	1.25	1.55	1.55	1.45	1.45	1.65
6	1.60	1.90	1.70	1.65	1.85	1.50	1.80	1.45	1.50	1.20	1.50	1.50	1.20	1.30	1.15
7	2.35	2.15	2.20	1.95	2.25	1.80	1.70	2.05	1.65	1.55	1.85	2.00	1.75	1.35	1.70
8	1.60	1.80	1.70	1.60	1.45	1.40	1.50	1.20	1.50	1.25	1.50	1.25	1.35	1.50	1.20
9	1.70	1.45	1.60	1.30	1.25	1.30	1.30	1.50	1.35	1.30	1.40	1.60	1.70	1.35	1.20
10	1.60	2.05	1.65	1.65	1.65	1.40	1.65	1.20	1.20	1.35	1.70	1.30	1.40	1.60	1.15
Avg	**1.71**	**1.85**	**1.72**	**1.63**	**1.62**	**1.57**	**1.51**	**1.38**	**1.42**	**1.37**	**1.56**	**1.52**	**1.44**	**1.37**	**1.37**
Min	1.60	1.45	1.40	1.30	1.25	1.30	1.20	1.15	1.20	1.25	1.40	1.25	1.20	1.10	1.15
Max	2.35	2.15	2.20	1.95	2.25	2.15	2.00	2.05	1.65	1.55	1.85	2.00	1.75	1.60	1.70

New probe used for each insertion. 1-10 standard probes, 11-15 Factron

100-SDN250W-H Probe Insertion															
Skt	*Insertion Number*														
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3.85	3.20	3.00	3.10	3.35	2.65	3.50	2.70	3.00	2.80	4.20	3.55	2.90	2.60	2.40
2	2.40	2.35	2.40	2.40	2.25	2.05	2.35	2.20	1.85	2.00	2.40	2.25	2.15	1.75	2.15
3	2.55	2.20	2.15	2.40	2.50	2.25	2.20	2.05	2.30	1.85	2.30	1.95	1.90	1.75	2.00
4	2.80	2.55	2.25	2.25	2.40	2.20	2.05	2.05	2.30	1.95	2.80	2.15	2.20	2.15	2.40
5	3.85	3.80	3.05	3.00	3.05	3.00	3.15	2.90	3.10	2.90	3.90	3.65	3.25	3.05	3.50
6	3.00	2.65	2.40	2.25	2.20	2.35	2.25	2.15	2.30	2.15	3.40	3.10	2.60	2.40	2.25
7	2.80	2.50	2.55	2.40	2.35	1.95	2.15	2.05	1.80	1.90	2.40	1.80	2.20	2.05	1.95
8	3.85	3.80	3.25	3.05	3.00	3.25	3.05	3.00	2.75	3.05	4.30	3.25	3.40	3.45	3.35
9	3.40	3.15	3.00	2.95	3.45	2.80	2.65	2.80	2.65	2.70	3.40	3.00	2.90	2.30	2.75
10	2.75	2.60	2.45	2.50	2.15	2.10	1.90	2.05	2.15	2.05	2.70	2.45	2.00	1.90	2.25
Avg	**3.13**	**2.88**	**2.65**	**2.63**	**2.67**	**2.46**	**2.53**	**2.40**	**2.42**	**2.34**	**3.18**	**2.72**	**2.55**	**2.34**	**2.50**
Min	2.40	2.20	2.15	2.25	2.15	1.95	1.90	2.05	1.80	1.85	2.40	1.80	1.90	1.75	1.95
Max	3.85	3.80	3.25	3.10	3.45	3.25	3.15	3.00	3.10	3.05	4.20	3.65	3.40	3.45	3.50

100-SDN250W-H Probe Retention															
Skt	*Insertion Number*														
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3.55	4.05	3.80	3.85	4.00	3.25	4.40	2.90	4.00	3.25	3.95	3.75	3.00	2.90	2.65
2	2.65	2.70	2.75	2.90	2.60	2.60	3.05	2.55	2.30	2.25	2.85	2.70	2.55	2.15	2.65
3	2.80	2.80	2.50	3.15	3.00	2.55	2.50	2.65	2.90	2.25	2.30	2.05	2.15	2.15	2.25
4	3.20	2.80	2.40	2.85	2.85	2.60	2.60	2.45	2.50	2.40	2.75	2.30	2.35	2.35	2.55
5	4.10	4.40	3.55	3.55	3.75	3.50	4.20	3.40	3.60	3.60	4.15	4.10	3.30	3.20	3.45
6	3.45	3.20	2.90	2.85	2.70	3.00	2.95	2.75	2.90	2.95	3.75	3.45	2.70	2.25	2.80
7	3.00	2.80	2.80	2.70	2.75	2.15	2.60	2.35	2.15	2.25	2.55	1.95	2.35	2.25	2.05
8	3.70	4.55	3.60	3.50	3.50	3.65	3.65	3.85	3.20	2.70	4.35	3.40	3.60	4.00	3.65
9	3.65	3.75	3.55	3.55	4.30	3.50	2.75	3.10	3.15	3.55	3.65	3.70	3.30	2.80	2.95
10	2.95	2.90	3.05	2.90	2.45	2.70	2.35	2.30	2.75	2.45	2.75	2.65	2.30	2.15	2.60
Avg	**3.31**	**3.40**	**3.09**	**3.18**	**3.19**	**2.95**	**3.11**	**2.83**	**2.95**	**2.77**	**3.31**	**3.01**	**2.76**	**2.62**	**2.76**
Min	2.65	2.70	2.40	2.70	2.45	2.15	2.35	2.30	2.15	2.25	2.30	1.95	2.15	2.15	2.05
Max	4.10	4.55	3.80	3.85	4.30	3.50	4.40	3.85	4.00	3.60	4.35	4.10	3.60	4.00	3.65

075-SDN250W Probe Insertion										
Skt	*Insertion Number*									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	2.55	2.00	2.20	1.45	1.95	1.60	1.15	1.65	1.90	1.00
2	2.90	2.45	1.40	1.80	1.70	1.80	1.55	1.25	1.15	1.05
3	2.85	1.80	2.05	1.55	2.20	1.40	1.60	1.25	1.25	1.80
4	3.10	1.50	1.35	1.45	1.30	1.35	1.60	1.25	1.35	1.50
5	3.10	2.30	1.80	1.45	1.80	1.70	1.70	1.45	1.70	1.65
6	2.70	2.55	1.40	1.50	1.35	1.80	1.90	1.45	1.45	1.15
7	2.95	2.60	1.60	1.95	1.35	1.35	1.40	1.10	1.75	1.50
8	2.65	1.20	1.75	1.75	1.65	1.10	1.60	1.55	1.30	1.40
9	3.05	2.05	1.85	1.90	1.75	1.15	1.70	1.70	1.50	1.30
10	2.55	1.95	1.60	1.15	1.70	1.40	1.55	1.30	1.05	1.45
Avg	**2.84**	**2.04**	**1.70**	**1.60**	**1.68**	**1.47**	**1.58**	**1.40**	**1.44**	**1.38**
Min	2.55	1.20	1.40	1.15	1.30	1.10	1.15	1.10	1.05	1.00
Max	3.10	2.60	2.20	1.95	2.20	1.80	1.90	1.70	1.90	1.80

075-SDN250W Probe Retention										
Skt	*Insertion Number*									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	1.00	0.95	0.95	0.90	0.95	0.80	0.85	0.90	1.00	0.85
2	1.15	1.25	1.10	1.10	1.20	1.15	1.10	1.15	1.05	1.05
3	0.95	1.05	0.90	1.00	1.40	1.00	1.00	1.00	1.00	1.05
4	0.95	1.00	0.95	1.10	0.95	0.90	0.95	0.80	0.95	1.00
5	0.95	1.00	0.85	0.95	0.90	0.90	0.95	0.90	0.95	0.95
6	1.15	1.10	1.10	1.00	1.10	1.05	1.45	1.00	1.00	1.00
7	0.95	0.95	0.95	0.90	0.80	0.85	0.80	0.80	0.90	0.90
8	1.10	0.95	0.95	1.25	0.95	1.00	1.15	0.95	1.00	0.90
9	0.85	0.85	0.80	0.85	0.80	0.85	0.85	0.80	0.80	0.80
10	1.05	1.05	1.05	0.95	1.05	1.00	1.05	0.95	0.95	1.10
Avg	**1.01**	**1.02**	**0.96**	**1.00**	**1.01**	**0.95**	**1.02**	**0.93**	**0.96**	**0.96**
Min	0.85	0.85	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80
Max	1.15	1.25	1.10	1.10	1.20	1.15	1.45	1.15	1.05	1.10

New probe used for each insertion.

050-SRB255P Probe Insertion										
Skt	*Insertion Number*									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	2.25	1.25	1.05	1.00	1.05	1.05	1.00	0.90	1.10	1.00
2	2.65	1.85	1.30	1.30	1.30	1.10	1.20	1.00	0.95	0.95
3	2.10	1.45	1.00	1.05	0.80	0.95	0.90	1.05	0.95	1.00
4	2.00	1.05	0.90	0.90	0.85	0.80	0.85	0.75	0.70	0.75
5	1.90	1.20	1.20	1.15	1.20	0.95	1.20	0.95	0.95	1.05
6	2.50	1.45	1.15	1.30	1.15	1.15	1.15	1.05	1.00	1.10
7	2.10	1.10	1.00	1.10	1.05	1.15	0.85	0.90	0.80	0.95
8	2.05	1.35	1.15	1.10	0.90	0.90	0.95	1.00	0.85	0.90
9	1.05	0.95	0.75	0.85	0.70	0.75	0.70	0.65	0.65	0.70
10	1.65	0.95	0.85	0.80	0.75	0.80	0.90	0.75	0.75	0.65
Avg	**2.03**	**1.26**	**1.04**	**1.06**	**0.98**	**0.96**	**0.97**	**0.90**	**0.87**	**0.91**
Min	1.05	0.95	0.75	0.80	0.70	0.75	0.70	0.65	0.65	0.65
Max	2.65	1.85	1.30	1.30	1.30	1.15	1.20	1.05	1.10	1.10

050-SRB255P Probe Retention										
Skt	*Insertion Number*									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	1.15	1.15	0.90	1.00	1.05	1.00	0.90	0.65	1.00	1.05
2	2.00	1.60	1.40	1.15	1.20	1.15	1.10	1.10	0.65	0.90
3	1.20	1.00	0.90	0.85	0.80	0.85	0.75	0.85	0.80	0.70
4	1.10	0.90	0.80	0.80	0.75	0.70	0.70	0.70	0.70	0.65
5	1.20	1.10	0.95	1.00	1.00	0.90	0.90	0.90	0.85	0.75
6	1.85	1.15	1.10	1.00	1.05	1.05	1.00	0.95	0.90	0.95
7	1.65	1.15	1.05	1.00	1.00	1.00	1.05	0.85	0.95	0.85
8	1.50	1.05	1.00	0.95	1.00	0.95	0.85	0.95	1.00	0.90
9	1.00	0.80	0.80	0.80	0.85	0.75	0.80	0.75	0.75	0.70
10	1.00	0.85	0.75	0.70	0.80	0.75	0.70	0.80	0.75	0.70
Avg	**1.37**	**1.08**	**0.97**	**0.93**	**0.95**	**0.91**	**0.88**	**0.85**	**0.84**	**0.82**
Min	1.00	0.80	0.75	0.70	0.75	0.70	0.70	0.65	0.65	0.65
Max	2.00	1.60	1.40	1.15	1.20	1.15	1.10	1.10	1.00	1.05