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Leak Testing Sabritec Connectors for use in the W87 Joint Test Assembly 4 Telemetry Plug

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Abstract

Sabritec NDL-T Ultraminiature Triaxial connectors for the W87 Joint Test Assembly telemetry plug for the new through body cable, CF3541, were leak tested and found to have a leak rate less than 1% of that allowed for the Telemetry Plug. The equipment, procedures, and measurements are summarized in this report.

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NOMENCLATURE

DOE	Department of Energy
JTA	Joint Test Assembly
sccs	standard cubic centimeters pre second
SNL	Sandia National Laboratories
TM	telemetry

1. INTRODUCTION

A Sabritec NDL-T Ultraminiature Triaxial connector in the Bulkhead Jack configuration (Sabritec part number 015100-5025) is part of the telemetry (TM) plug for the W87 Joint Test Assembly (JTA) 4 new through body cable, CF3541. Figure 1 Top shows a drawing of the connector. The TM plug is required to have a maximum leak rate of less than $10x10^{-4}$ standard cubic centimeters per second (sccs) of helium at one atmosphere. The Sabritec connectors were tested to insure that they did not contribute significantly to the leak rate of the TM plug as a whole.

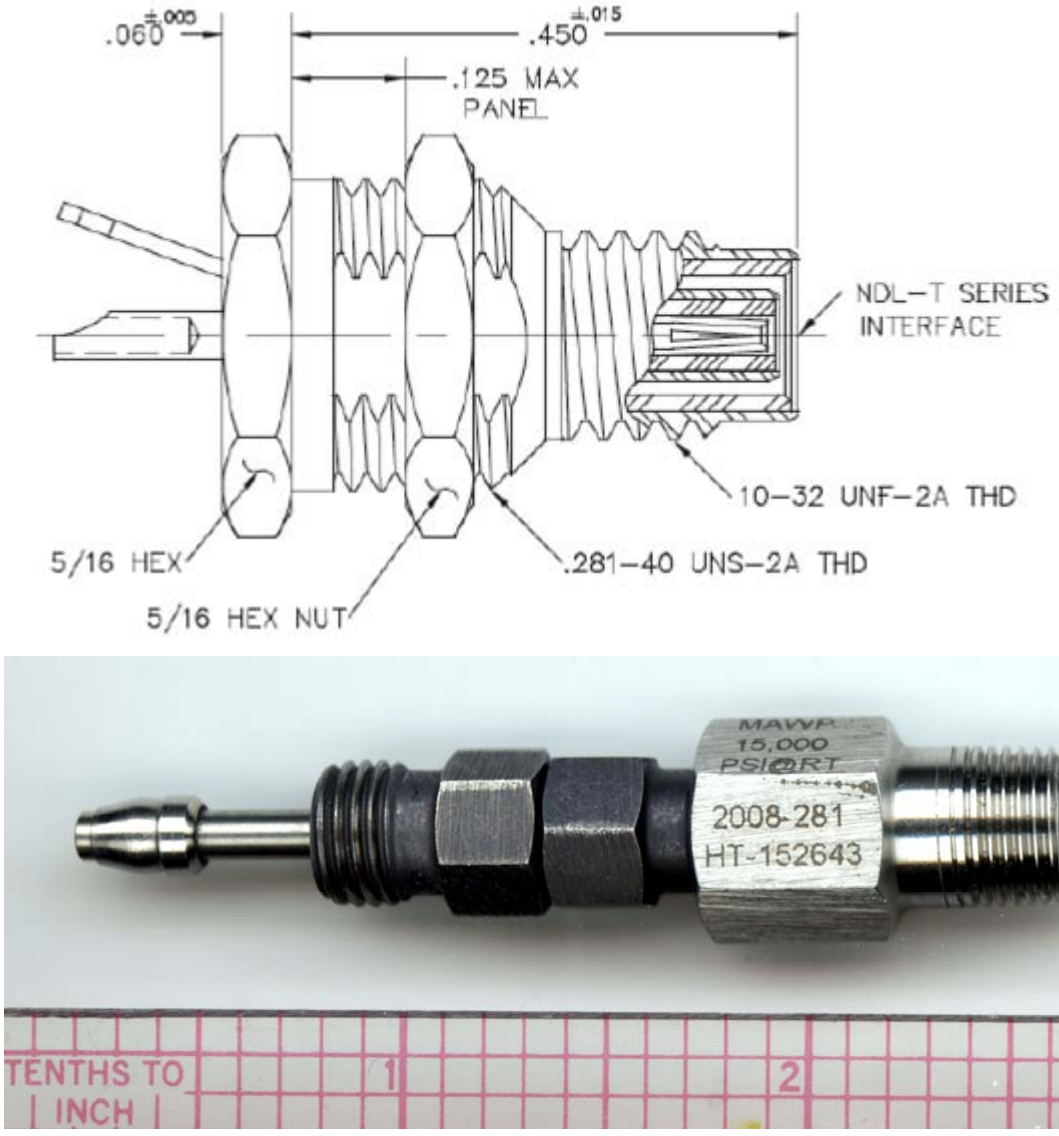

Figure 1. Top: Drawing of Sabritec NDL-T Ultraminiature Triaxial Connector in the Bulkhead Jack configuration (Sabritec part number 015100-5025) (see Ref. 1). Bottom: Adapter from Sabritec connector to the manifold on the bell jar.

2. EXPERIMENTAL

Leak testing was done using the vacuum bell jar in the Sandia National Laboratories, California Gas Transfer Systems High Pressure Laboratory. An adaptor was fabricated to connect the 10-32 UNF-2A threaded fitting on the Sabritec connector to the 1/8" ermeto connector on the vacuum manifold on the bell jar (Figure 1 Bottom). This permitted the Sabritec connector to be tested either before or after assembly into the W87 TM Plug.

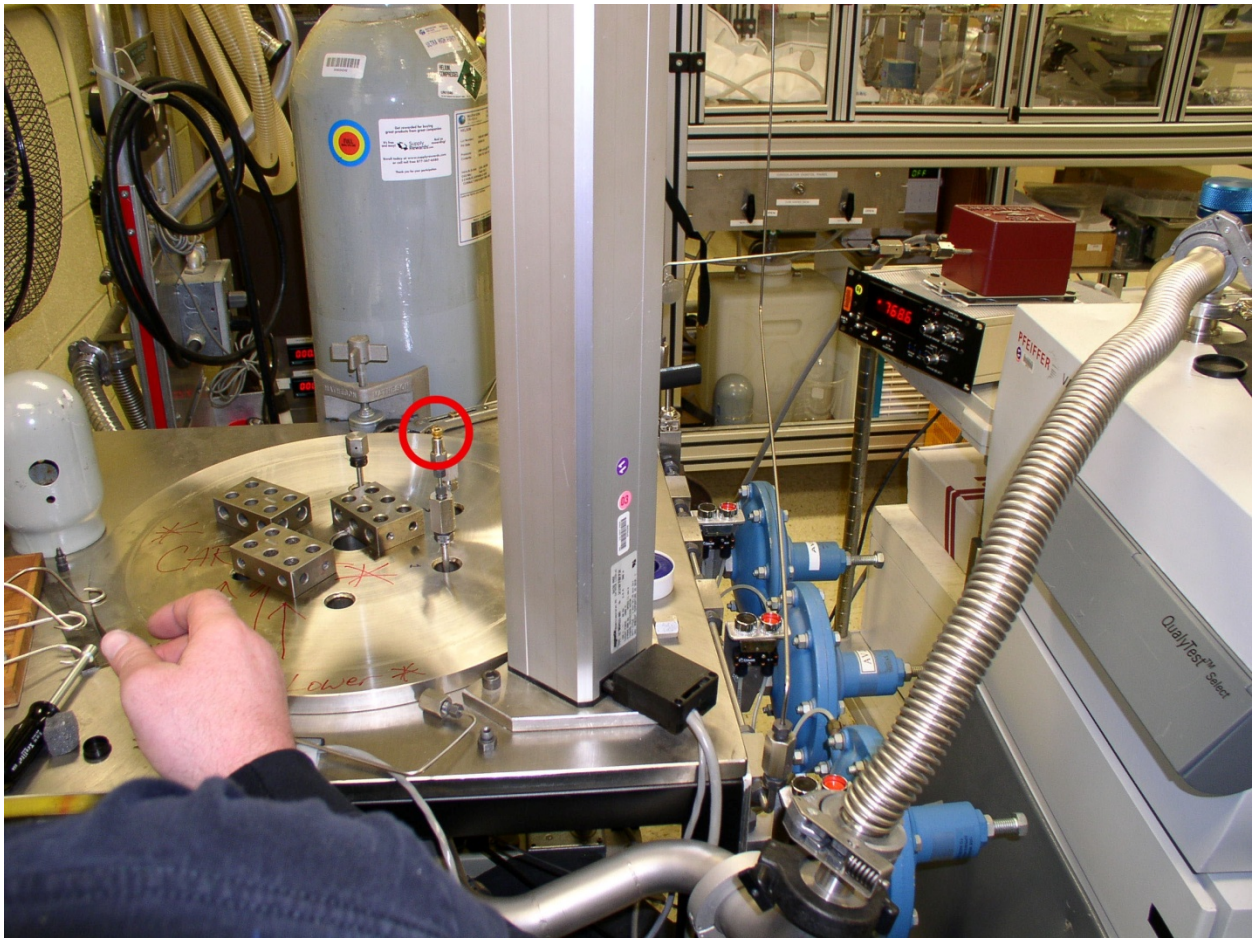

Figure 2: Sabritec connector set up for leak detection. To the right is the Pfeiffer leak detector used for most of the measurements.

Figure 2 shows the Sabritec connector installed on the bell jar manifold. The maroon box in the upper right is the sensing head for a capacitance manometer. It is sitting atop its digital read-out. This permits us to read the vacuum level before helium backfill and to read the helium pressure during leak checking. The large flexible steel tubing to the right connects the bell jar manifold to the Pfeiffer leak detector, which has its own vacuum in addition to the helium

detection equipment. Figure 3 shows a Sabritec connector that has already been assembled into a W87 TM Plug connected to the bell jar manifold. It also shows the Alcatel leak detector that was initially used for leak testing as well as the bottom of the bell jar, seen in the upper left. The bell jar rides on the square vertical rail seen in the center of Figure 2.

More details of the experimental procedure are in SAND2012-5930. (see Ref. 2).

Figure 3: Sabritec connector in TM plug set up for rough leak detection. This was to determine is the Sabritec connector was contributing to a failed leak rate on a TM plug connector. To the right is the Alcatel leak detector used for initial measurements.

The procedure for leak checking is:

- Record the temperature. This is in case a leak rate measurement needs to be corrected to STP.
- Install connector on adapter on Ermeto on bell jar manifold. Use an o-ring. (see Ref. 3)
- Lower bell jar.
- Evacuate bell jar.
- Simultaneously evacuate the side of the connector connected to the leak detector.
- Record leak rate measured 5 min. before introduction of helium.
- Backfill bell jar with ~1 atmosphere helium.
- Record leak rate 5 min. after introduction of helium.

3. RESULTS

The specification for the leak rate of the W87 TM Plug is $1x10^{-4}$ sccs at one atmosphere of helium. Thus a leak rate for the Sabritec connector of less than 1% of that value, as all of the tested Sabritec connectors showed, should not present a concern. Indeed, most of the units showed a lower apparent leak rate after helium introduction. This indicates that the connection between the unit and the leak detector was still pumping down even after an atmosphere of helium was introduced on the other side of the connector. i.e. the measured leak rate represents an upper bound to the actual leak rate for all but two on the connectors.

N.B. Before the one atmosphere of helium condition was implemented, one of the units was exposed to 350 psi of helium and showed no leak.

The leak rates measured 5 minutes before and 5 minutes after introduction of helium and the actual pressure of helium used is summarized in Table 1.

Table 1. Sabritec connector leak rate measurements.

ID	Before He*	After He*	Torr He**
1	2.5	1.4	774
2	2.3	4.6	889
3	1.7	1.4	871
4	1.4	1.6	766
5	0.8	0.5	780
6	0.8	0.6	784
7	0.5	0.4	781
8	0.4	0.4	780
9	0.6	0.4	773
10	0.4	0.4	902
11	0.4	0.4	766

* measured leak rate in sccs $x10^{-7}$.
** measured pressure of He used. 1 atmosphere is ~760 Torr.

4. CONCLUSIONS

The Sabritec connectors measured are not significant contributors to the leak rate of any TM plugs and CF3541 through body cables into which they are built.

5. REFERENCES

1. Drawing from *Connector, Triax, Bulkhead Jack (U),* AY1W3189, Cage Code 14213, Commercial Part, R.Davis, 8A2KC, M. Hollock, 892KC, L. Curtis, 1734SA, TIE SA/KC, DRC 2, 6/16/08.
2. Nissen, April, Whinnery Jr., LeRoy L., Mistry, Vipul, Mills, Bernice E., Mckinnis, Quenton L., *Development of New Potting Material and Process for W87 JTA4 CF3541 TM Plug, (U),* SAND2012-5930,Sandia National Laboratories, Livermore, CA (OUO), July, 2012.
3. McMaster-Carr part number AS568A-007 Viton® ETP fluoroelastomer. Width: 1/16" Fractional (0.070" Actual). Fractional ID 5/32”; fractional OD9.32”; actual ID 0.145”; actual OD 0.285”.

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