Test Report 9300.D71.918 StealthTelecom

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Referenced papers:	IC8100ZIP

Tuning/Matching Consistence TEST -40C° vs +25C° vs +70C°

Test sequence was done using following equipment:

1. Custom CR-type dummy load made of 15pF RF-capacitor and 75Ohms non-inductive resistor as whip emulator.
2. Custom wire wound resistor HP4275A tuned to 0.20032Ohms at +26C°.
3. Tektronix TDS724D DPO
4. HP34401A (3A RMS) Multimeter
5. Diamond GSW3000 and Astron VS-50M-220E Power Supplies
6. IC-F8100 (S/N21001003) radio as RF-source set to manually inject 30 preprogrammed frequencies one after another with 1MHz increment starting from 1.6MHz, with tuning power set as for AT-140.
7. HP8752A Network Analyzer
8. Diamond coaxial changeover switch.
9. PC with CPS9300 connected via USB when reading data accumulated by the 9360.
10. Environmental chamber.
11. Standard SEAC 6m Control Cable
12. Standard 6m RG-58 Coaxial Cable
13. Standard SEAC-to-IC-F8100 Adaptor Cable
14. Standard Icom OPC 2201/AD119 override cable (DB25)

- The 9360 assembled from all production level parts and tested in same mounting/wiring conditions as described in TR9300.D71.917.
- The 9360 was CPS9300 programmed to work without use of Memory Tune.
- 9360 was powered directly from IC-F8100, test voltage set to 13.6VDC.

Tasks:

Task A. To determine possible tuning and matching inconsistence influenced by temperature changes in -40C° to +70C° range with intermediate test on ambient +26C° temperature using BITE-provided facility of automated logger/plotter data acquisition for comparison. Measurements are based on readings of in-built RF-multimeter (SWR-Sensor).

Note 1: *The 9360-8100 RF connection was made using coaxial switch to changeover antenna input between IC-F8100 and calibrated HP8752A Network Analyzer, enabling precise VSWR measurements at the transceiver input. Those SWR readings are used as matching reference obtained at the IC-F8100 side, e.g. including 6m cable influence. No RF-choke over cable braid was used.*

Task B. To determine whether the calibration performed at room 26C° is still accurate to provide true data for tune/match circuitry in extreme low -40C° and extreme high +70C° specified temperatures. Criteria of decline of accuracy/sensitivity of the RF-multimeter circuitry is derived from quantitative comparison of SWR units measured by the 9360 and HP8752A at 30 frequencies tuning/matching conditions (Tuning value and Stepper Inductor address binary digits) obtained at -40C°, +26C° and +70C°, e.g. in 90 fixed frequencies.

Note 2: *During 917-series tests we frequently opened chamber for sounds analysis resulted in poisoning chamber by humid. This allowed to see how excessively humid chamber with associated icing will affect motor grease and bearings function (how antenna would work in low temperatures with pierced or otherwise damaged enclosure). For this purpose -40C° cold chamber was opened and idle (in a sleep mode) antenna was allowed to produce heavy frost on all mechanic and electronic parts. Then chamber was closed and brought back to -40C° and awoken antenna forced to perform basic tuning and BITE Inductor Condition Test. It was noted that antenna still performed well, however motor turned slower under approximately doubled DC-drain. To eliminate icing of the 9360 for 918-series tests, the chamber was first brought to +70C° and door was opened for 5 min to remove steam (approx. up to 62%), after what 9360 was inserted into hot chamber and kept for 2 hours to settle internals to +70C°. Hence, tests started from +70C° downwards to -40C°, followed by gradual decreasing Chamber temperature by -5C° stops for Temp Sensor calibration in fairly dry chamber.*

Task C. Proving linearity and performing calibration of in-built temperature sensor and associated ADC input in every 5C increment per record.

Note 3: *During performing Tasks A-C at extreme high and low temperatures we have reconnected 9360 from SEAC-Icom Adaptor to measure DC-drain using precision 0.2Ohms resistor as voltage drop source for oscilloscope and RMS-multimeter.*

Note4: 918 test series were not targeting to comply fully with Icom's suggested "Before-After "method due to extremely low inertia of Environmental Chamber and inwards of 9360 which in sum require ***90x(3min cycles to AFTER) x2(hours settle to BEFORE)=540hours=23 days test to do it correctly.***

Task D. 6 min test at full IC-F8100 RF output at 1.6MHz one time at -40C and one time at +70C followed by full stroke tune to 30MHz position after both 6 min tests.

Results. Conclusions and Interpreting:

All required data is obtained, documented and three graphs were plotted.

1. Antenna worked stabile in 30 frequencies bursts under all three conditions and in occasional tune cycles in every -5C° shifts.
2. IC-F8100 in-built bar graph type SWR meter did not detect any SWR increase but displayed SWR 1.1:1 in all 90+ occasions. HP8752, however, detected some SWR-change ranging no more than +0.2, which is caused by internal 9360's SWR-meter slight accuracy variations at both extreme edges that did not affect antenna correct functioning.

3. No single tune/match malfunction under -40C°, +26C° and +70C° test conditions were registered in all activation occasions.

DC drain/state at 13.6V, Match Delay 15mS	917 test -40C frozen NGT	918 test -40C dry 8100	917 test +70C wet NGT	918 test +70C dry 8100
Initialization cycle after ON	4.7A max	3.1A	2.8A max	2.8A max
Stand by after Initialization	100mA	100mA	80mA	81mA
Sleep Mode - all relays - OFF	80mA	81mA	54mA	52mA
Tuning to New Frequency	2.5A max	2.0A max	1.8A max	1.8A max
T1, T2 ON	152mA	150mA	102mA	100mA
Sleep Mode - T1, T2 - ON	128mA	129mA	79mA	83mA
"Drop Ball" Test (Inductor conditioner)	1.4-2.6A	1.5-2.1A	1.4-1.9A	1.5-1.9A

4. 918 tests confirm results obtained from 917 series tests with high degree of repeatability.

+26C° room temperature	Direct from Astron PS	Direct from Astron PS	Direct from NGT antenna port
Minimum DC Voltage at CPU PCB 9360 still works	*10.0V (no 30V drop) As specified if no losses in wiring/connections.*	*9.0V (drop in 30V) Still works reliably if no losses in wiring connections*	*11.1VDC (no 30V drop) Approx. 2V loss in internal NGT's relay, PCB and connectors when Initializes.*

5. No damage to antenna or after-test tuning malfunctions detected after performing Task D. RF-nature of the 9360 and closed access to internals does not allow using thermocouple or infrared beam thermometer. New "before-after" style test without intermediate cooling to "before" condition after each "after"condition shall be performed separately starting from -40C° upward until failure. This type of tests will be conducted after getting enough samples. However, preliminary outdoor tests at +43C° ambient (cased and open antenna) with more than 15 min (brick on key style) under 100W PEP were routinely performed without damage (no records were made).

Note 5: *CPS9300 data logger is of automatically scaling type, e.g. automatically adjusts measurement ranges to measurement result achieved.*

Excel extended reports produced by CPS9300 are attached in Referenced Documents.

TR9300.D71.918 -END OF DOCUMENT- STEALTH