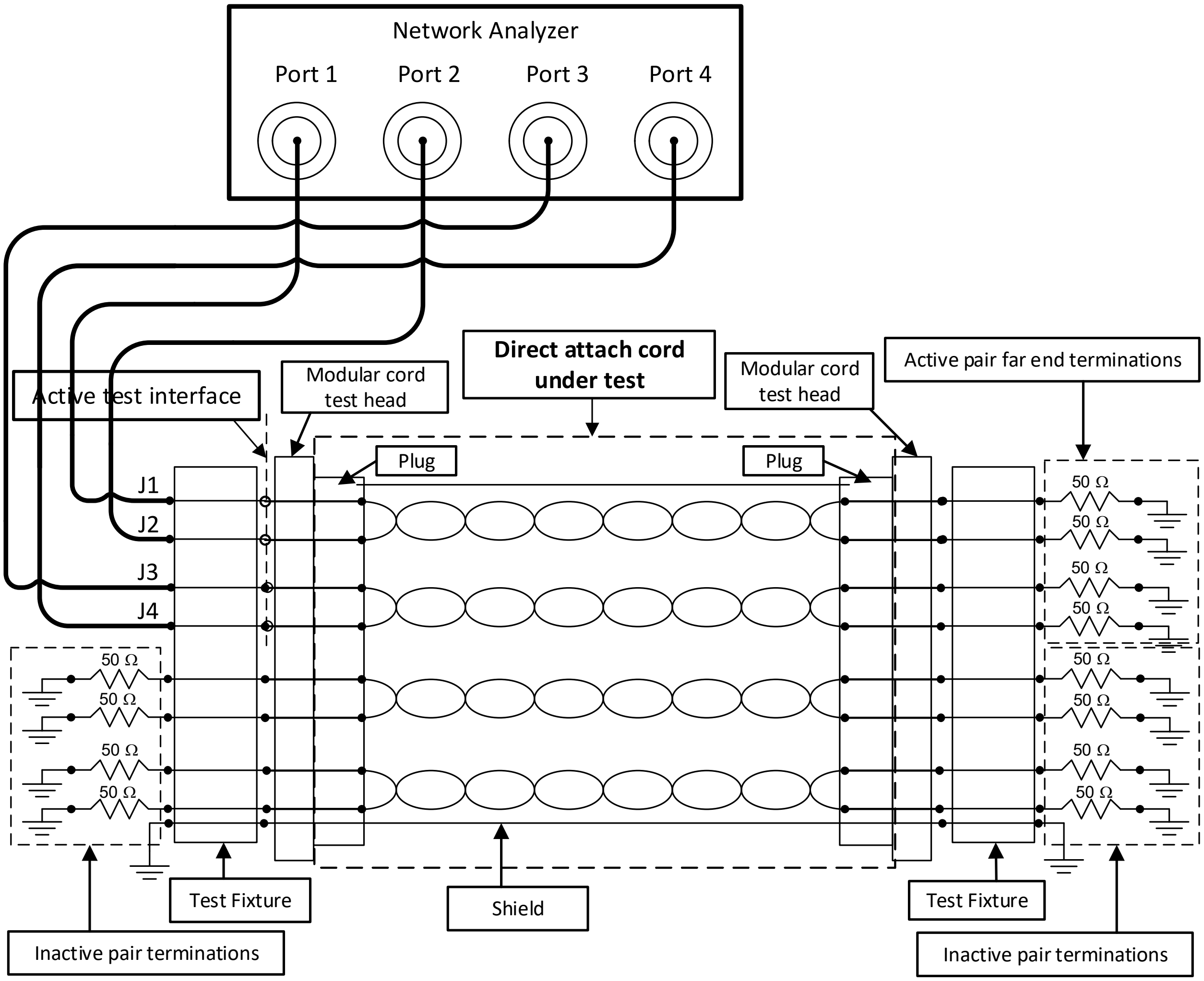

Figure D.12 - Balunless direct attach cord NEXT loss test configuration

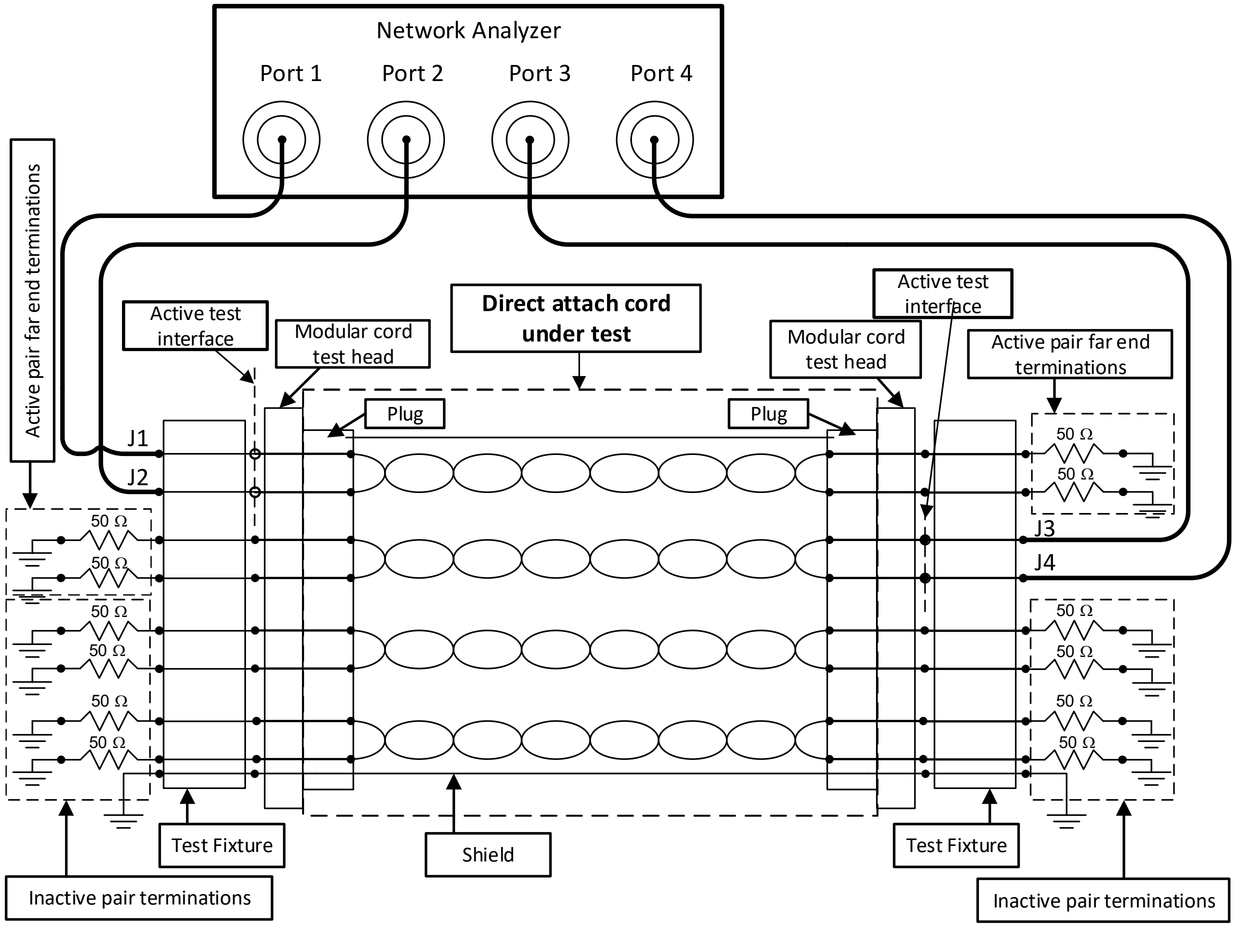

Figure D.13 - Balunless direct attach cord FEXT loss, (ACRF) test configuration

D.6 Balunless modular cord test procedures

D.6.1 Balunless network analyzer test configuration

The balunless network analyzer configuration for modular cord testing is depicted in Figure D.14 and Figure D.15.
This measurement is shown using single-ended balunless measurements described in TIA-1183-A.
50 Ω terminations shall be applied to all conductors on both ends.

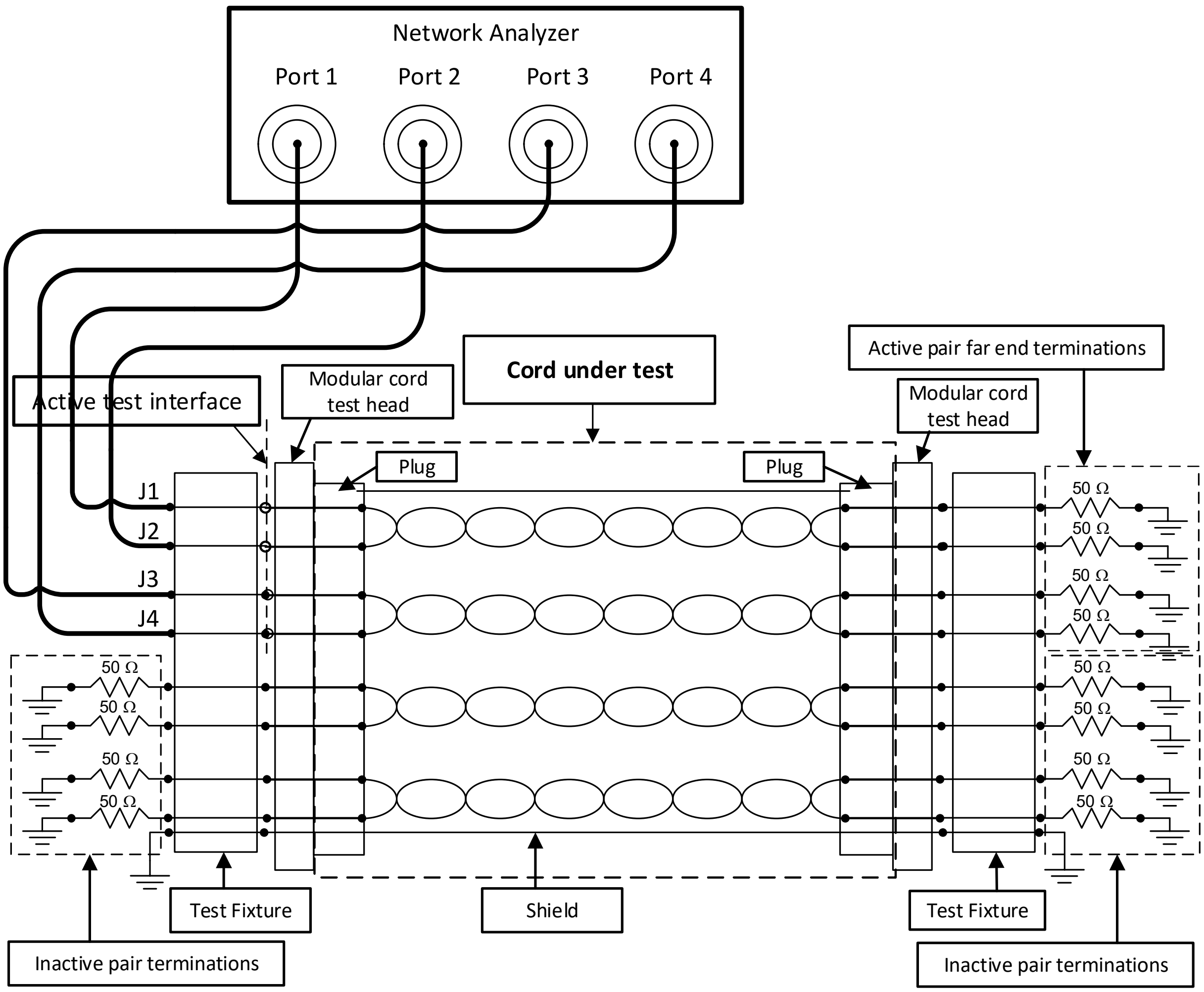

Figure D.14 - Balunless modular cord NEXT loss test configuration

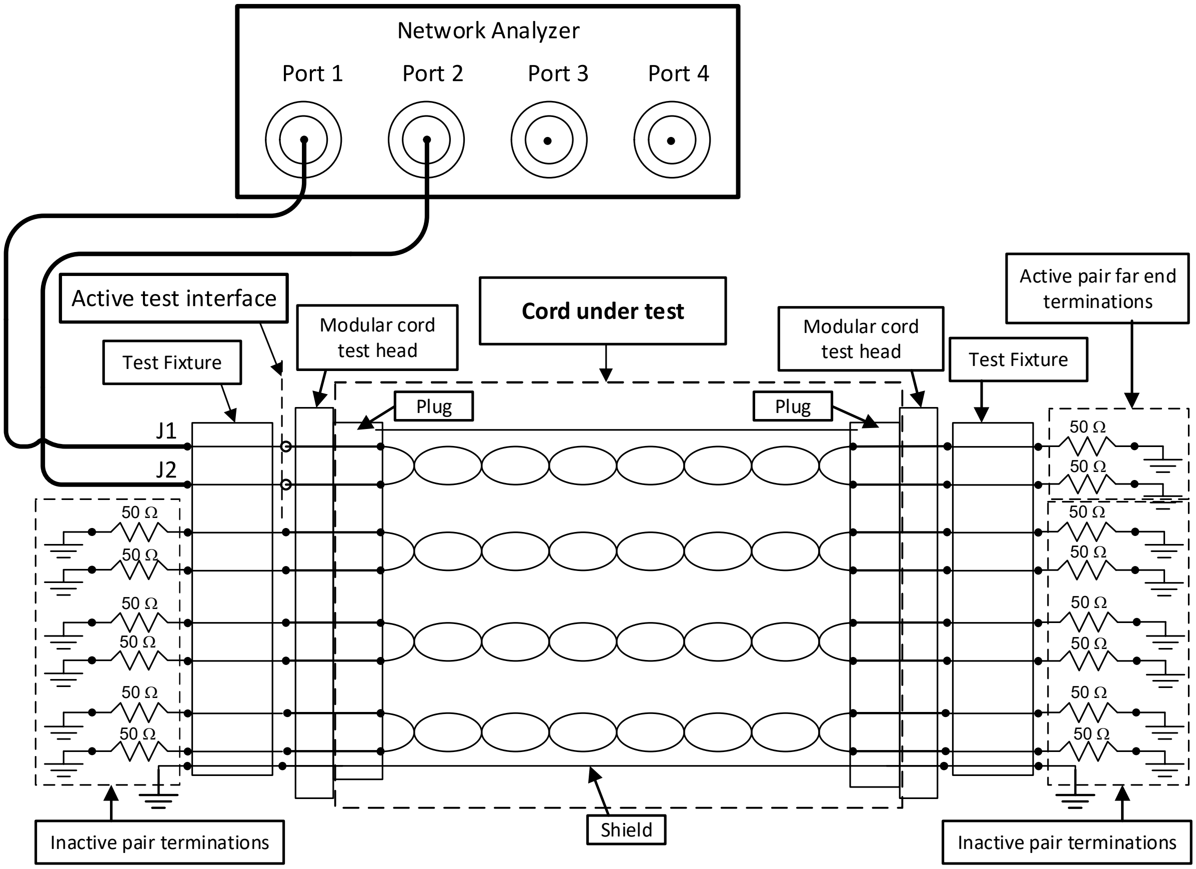

Figure D.15 - Balunless modular cord return loss test configuration

D.7 Connecting hardware test procedures

This clause describes test and calibration procedures for connecting hardware using balunless test configurations. Test equipment design calibration and fixturing should ensure a noise level 20 dB better than the required measurement limit over the frequency range of 1 MHz to the upper frequency of the category.

All requirements of clauses C.1 and C.2 that are not superseded by this clause apply.

D.7.1 Connecting hardware measurement configurations

For balunless measurements:
Each SE port shall be terminated using 50 Ω to ground according to ANSI/TIA-1183-A.

The measurement results shall be mathematically transformed to convert the measured values in the native common mode impedance of 25 Ω to the resultant values which are referenced to the common mode impedance of 50 Ω which are required by this standard.

Interconnection (including test lead) requirements are specified in clause B.2.

D.8 Balunless alien crosstalk for cabling, cable and connecting hardware.

D.8.1 Balunless ANEXT loss and AFEXT loss laboratory measurement procedures

Refer to the procedures in clause C.8 for alien crosstalk testing procedures using the network analyzer configurations of this clause.

D.8.1.1 Balunless connecting hardware ANEXT loss and AFEXT loss procedures

The ANEXT loss measurement is performed between two DUTs as shown in Figure D.16. The AFEXT loss measurement is performed between two DUTs as shown in Figure D.17. Each DUT consists of a mated modular plug and socket combination and shall be mounted in its specified mounting arrangement (e.g. patch panel, TO) according to the manufacturer's instructions. Each modular test plug should be of a design known to meet the test plug requirements detailed in clause C.6.5. Cables between the baluns and the DUT should be less than 300 mm (12 in). If interconnecting cables need to be longer than 300 mm (12 in) (e.g. testing large multi-port panels), their insertion loss shall be accounted for.

The other end of each of the terminating cables should be DMCM terminated, with the CM terminations of the four pairs in each cable connected to ground.

For ANEXT loss measurements, it is recommended that the far-end of each modular plug and socket mated combination be terminated with a minimum of 40 m (131 ft) of cable. For AFEXT loss measurement, it is recommended that the far-end of the disturbing modular plug and socket and near-end of the disturbed modular plug and socket are terminated with a minimum of 40 m (131 ft) of cable. The use of minimum category 6A-rated S/FTP cable (as defined by ISO/IEC 11801, 2nd Ed.) is recommended.

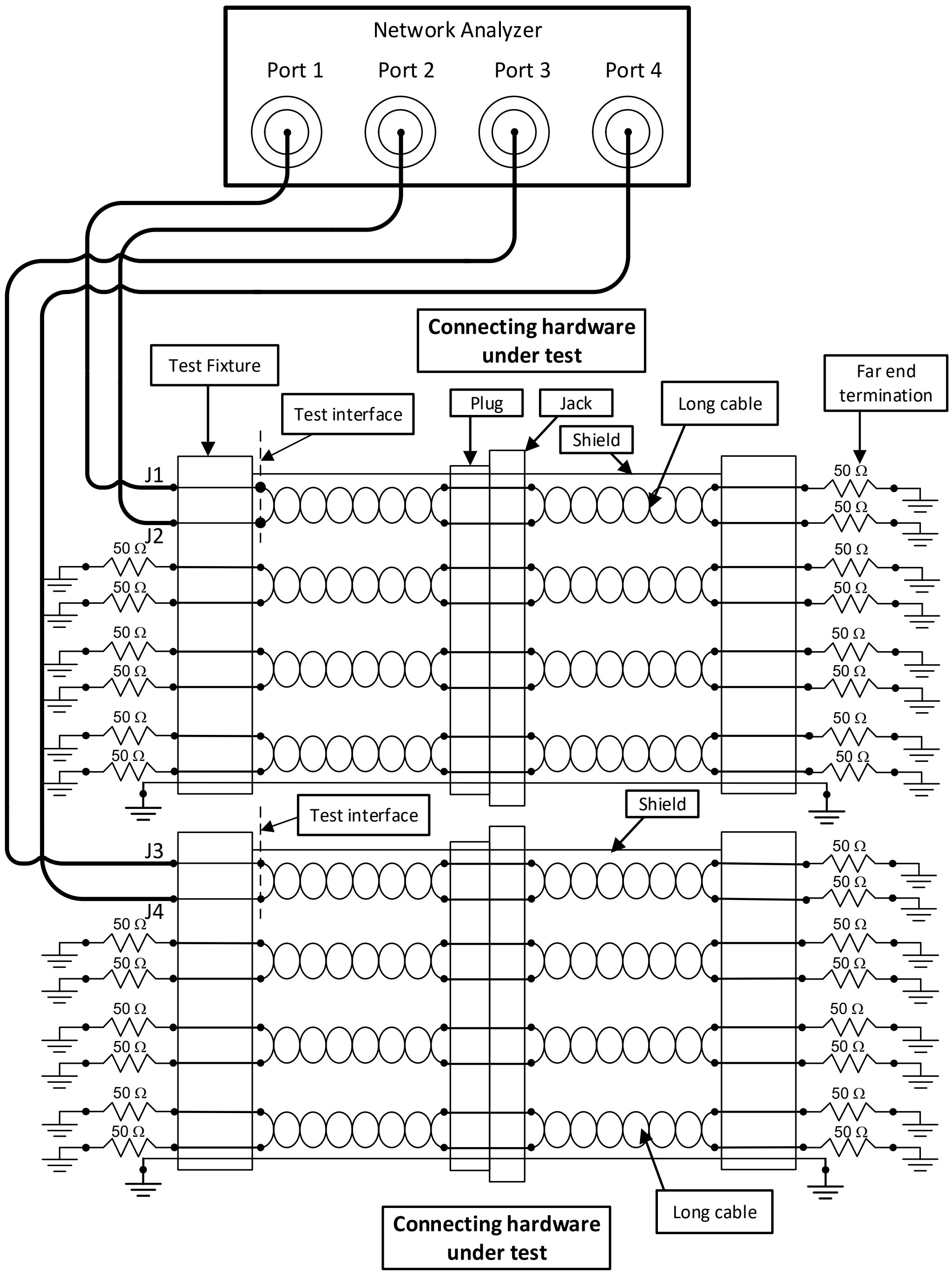

Figure D.16 - Connecting hardware ANEXT loss measurement setup

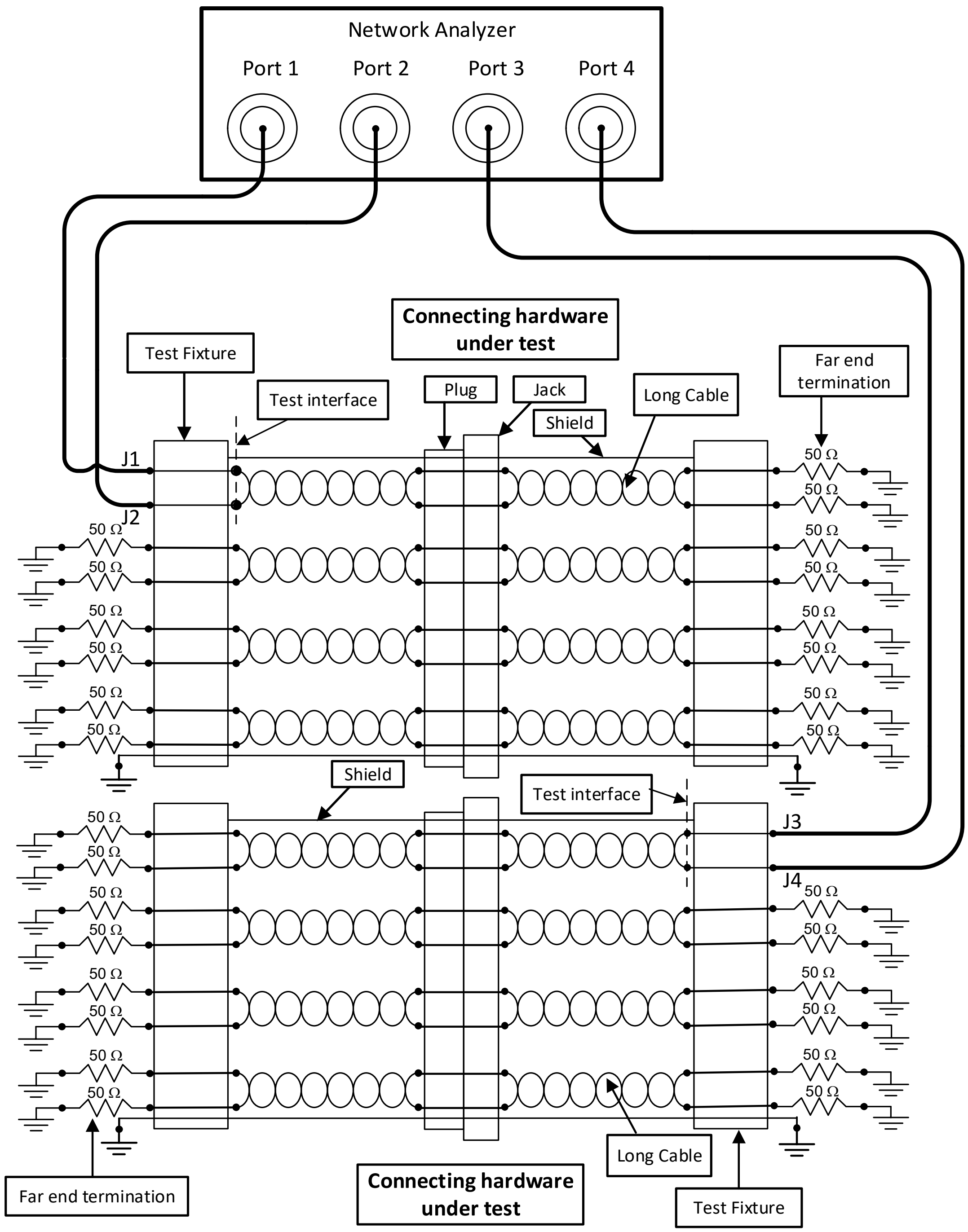

Figure D.17 - Connecting hardware AFEXT loss measurement setup

Annex E (normative) - Connecting hardware transfer impedance test method

E.1 Introduction

Transfer impedance relates to the shielding efficiency (quality of shielding against influences by electromagnetic fields) of screened cables and connecting hardware.

E.2 Purpose and scope

This annex describes a test method for connecting hardware transfer impedance. Transfer impedance is not intended for conformance testing of installed cabling. Setup variations that yield equivalent results are also acceptable.

E.3 Transfer impedance test method

E.3.1 General

This clause describes the measurement method used in verifying the shield transfer impedance requirements of 100 Ω screened connecting hardware contained in clause 6.10.21. The measurement method requires the use of a network analyzer or equivalent, coaxial cables, screened test leads, impedance matching terminations, and a high frequency (HF) sealed case. The setup is qualified to a measurement bandwidth of at least 10 kHz to 100 MHz. Calibration procedures for insertion loss are specified by the manufacturer of the test equipment. Transfer impedance values can be calculated from laboratory shielding insertion loss measurements collected using a HF sealed case (refer to clause E.3.2). The equivalent circuit diagram for the HF sealed case is shown in Figure E.1.

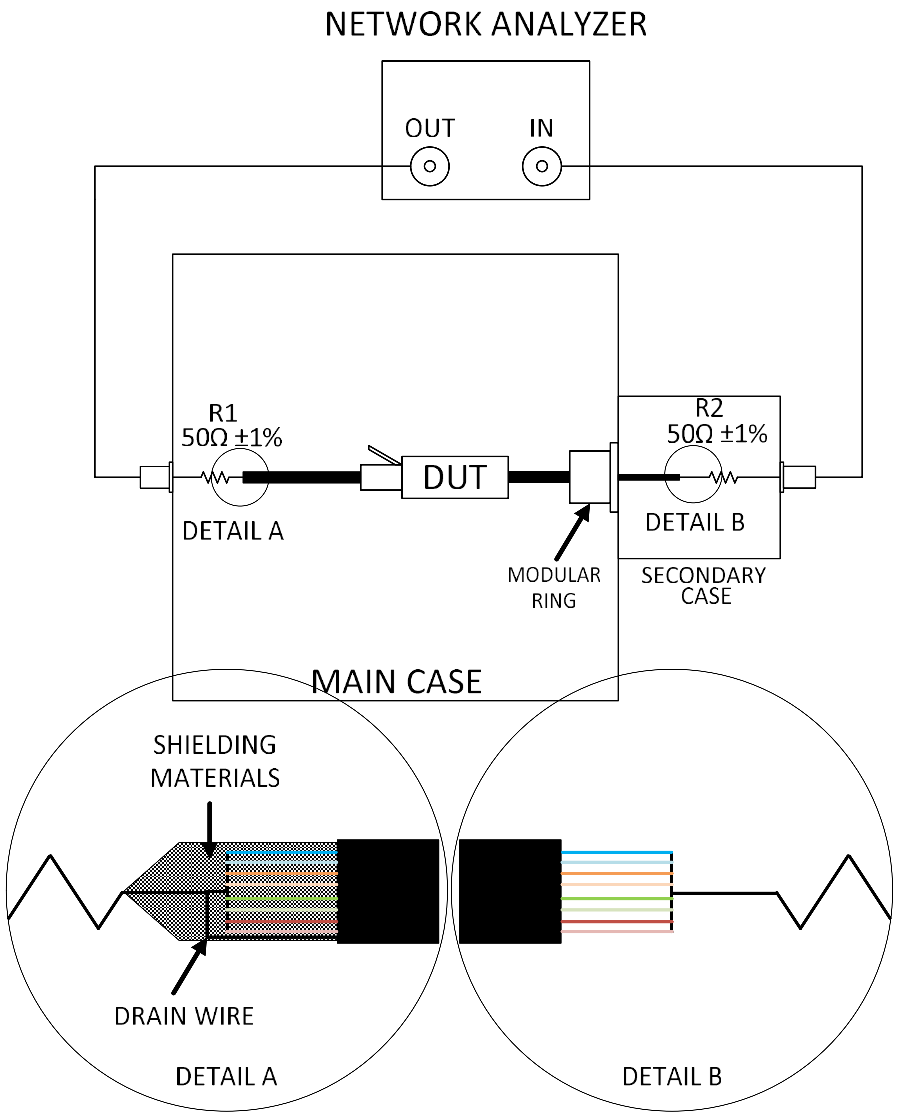

Figure E.1 - Equivalent circuit diagram for HF sealed case

Where:

$Ri1 = Ri2$ = characteristic impedance of the network analyzer = 50 Ω
$R1$ = feeding resistor = 50 Ω
$R2$ = terminating resistor = 50 Ω
$U1$ = transmitter voltage (volts)
$U2$ = receiver voltage (volts)
U_c = voltage across device under test (volts)
Z_{cond} = characteristic impedance of conductors (Ω)
Z_t = transfer impedance (Ω)

Under the following assumptions:

Z_{cond} is significantly less than $R2$, and
$I2$ is significantly less than $I1$,

The following equations describe the circuit equation in Figure E.1.

$$U1 = I1 \cdot R_i1 \tag{E-1}$$

$$U2 = I2 \cdot R_i2 \tag{E-2}$$

$$U_c = I2 \cdot (R2 + R_i2) \tag{E-3}$$

$$U_c = Z_t \cdot I1 \tag{E-4}$$

From a substitution operation follows:

$$Z_t = \frac{R_i1}{R_i2} \cdot (R2 + R_i2) \cdot \frac{U2}{U1} \tag{E-5}$$

Measured shield insertion loss a_s, in decibels, is described by the relation:

$$a_s = 20 \cdot \log\left(\frac{U2}{U1}\right) \ dB \tag{E-6}$$

By applying this relation and entering values for $R2$ and R_i2, the resultant transfer impedance in Ohms is expressed as:

$$Z_t = 2 \cdot R_i1 \cdot \frac{U2}{U1} = 2 \cdot R_i1 \cdot 10^{\frac{a_s}{20}} = 100 \cdot 10^{\frac{a_s}{20}} \ \Omega \tag{E-7}$$

E.3.2 Test setup and apparatus

Equipment list:

- Network analyzer (50 Ω characteristic impedance)
- Coaxial adapters as required to make network analyzer port connections. Sub-miniature type A (SMA) adapters are recommended, however, other adapters may also be acceptable.
- HF sealed case
- Rosin core solder
- Aluminum soldering flux
- Precision ±1% 50 Ω metal film resistors
- EMI/RFI foil shielding tape (adhesive backing optional)

Connecting hardware shall be tested with the cable shield construction with which it is designed to be used. If the connecting hardware is designed for several cable shield constructions, it shall be tested with the construction of single foil with drain wire. The diagrams in Figure E.4 through Figure E.7 provide a detailed reference to the dimensional characteristics of the HF sealed case. The HF sealed case shall be constructed from sheet copper or brass of 2 mm (0.08 in) minimum thickness.