



Fermi National Accelerator Laboratory

**D-Zero Detector Calorimeter Electronics
Run II b Upgrade Project**

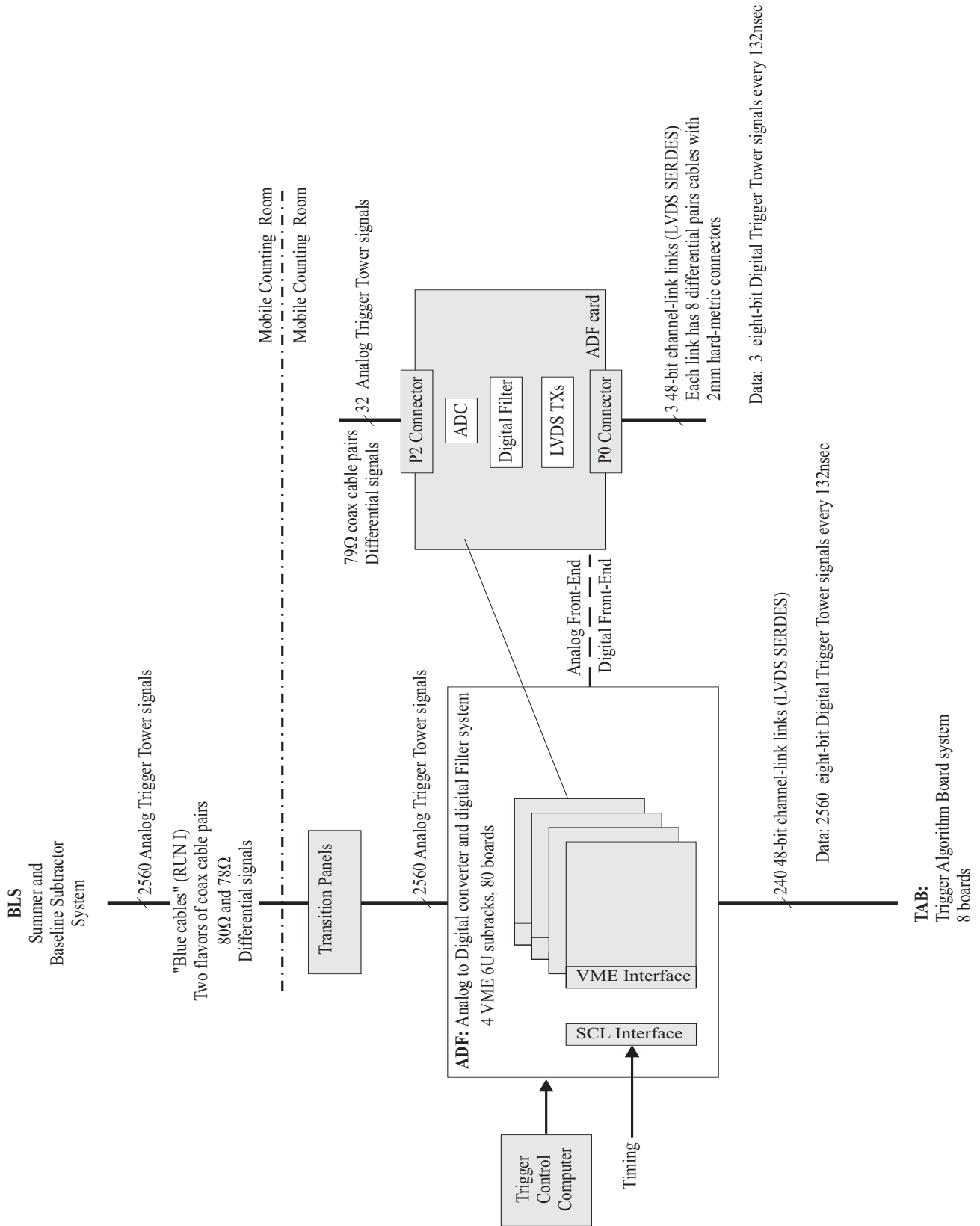
Test Waveform Generator System

July 29th, 2004

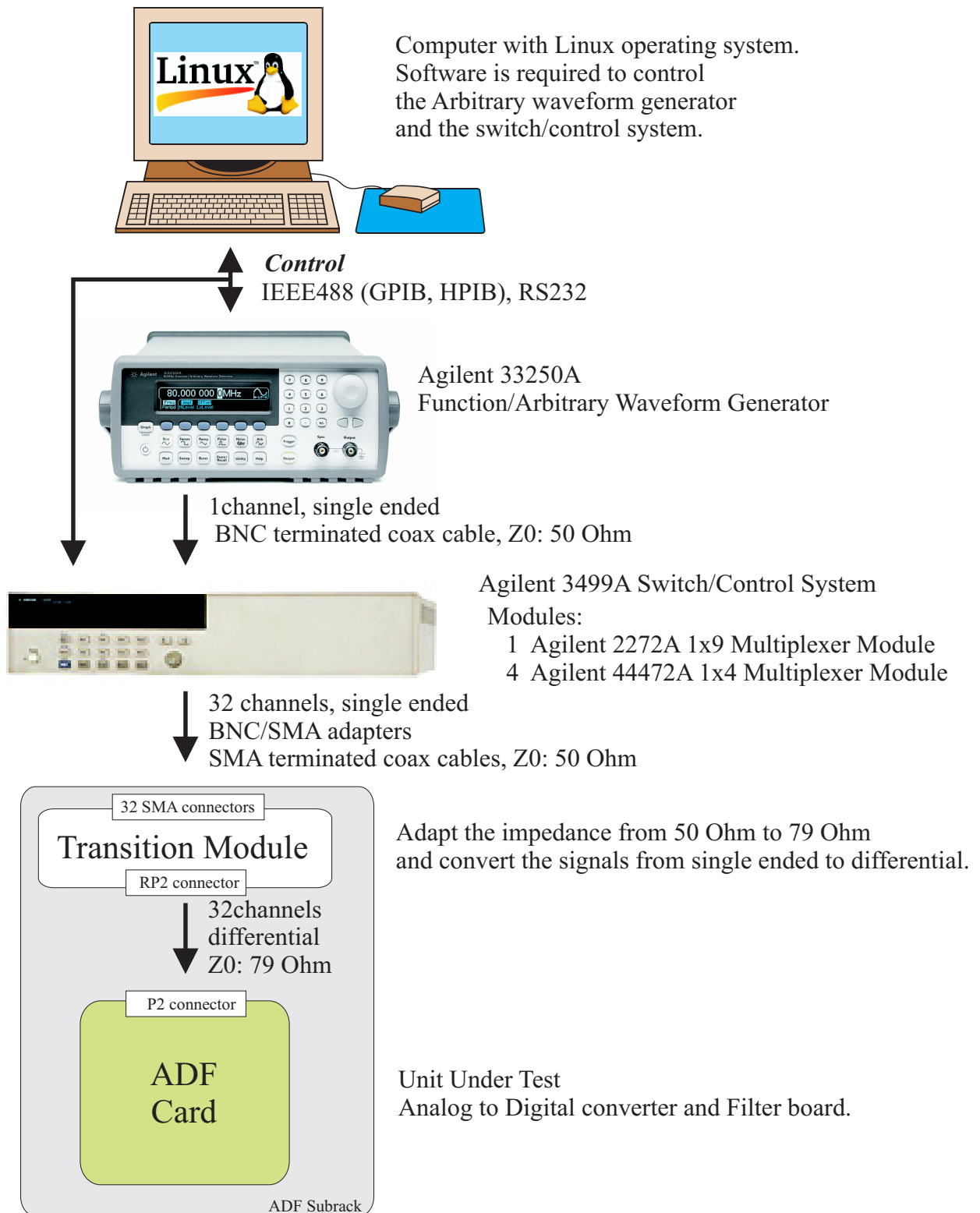
Stefano Marco Rapisarda

Test Waveform Generator System documentation:
http://www-ese.fnal.gov/D0Cal_TWG/

System Under Test - The D0 calorimeter Level 1 Trigger System



Test Waveform Generator system



Computer

Minimum Requirements

Interface ports to control the TWG system: GPIB I/O or RS-232 (2 ports).

Arbitrary Waveform Generator

One Arbitrary Waveform Source: *Agilent 33250A*



The Agilent 33250A Function/Arbitrary Waveform generator uses direct digital synthesis to create output waveform down to 1 μ Hz frequency resolution.

Waveforms

80MHz sine and square wave outputs

50MHz pulse waveform with variable rise/fall times

12-bit, 200Msa.s, 64K-point deep arbitrary waveform.

Output characteristics

Signal source impedance: 50 Ω

Amplitude (into 50 Ω): 10 mV_{pp} to 10 V_{pp}

Interfaces

IEEE-488 (GPIB, HPIB)

RS232

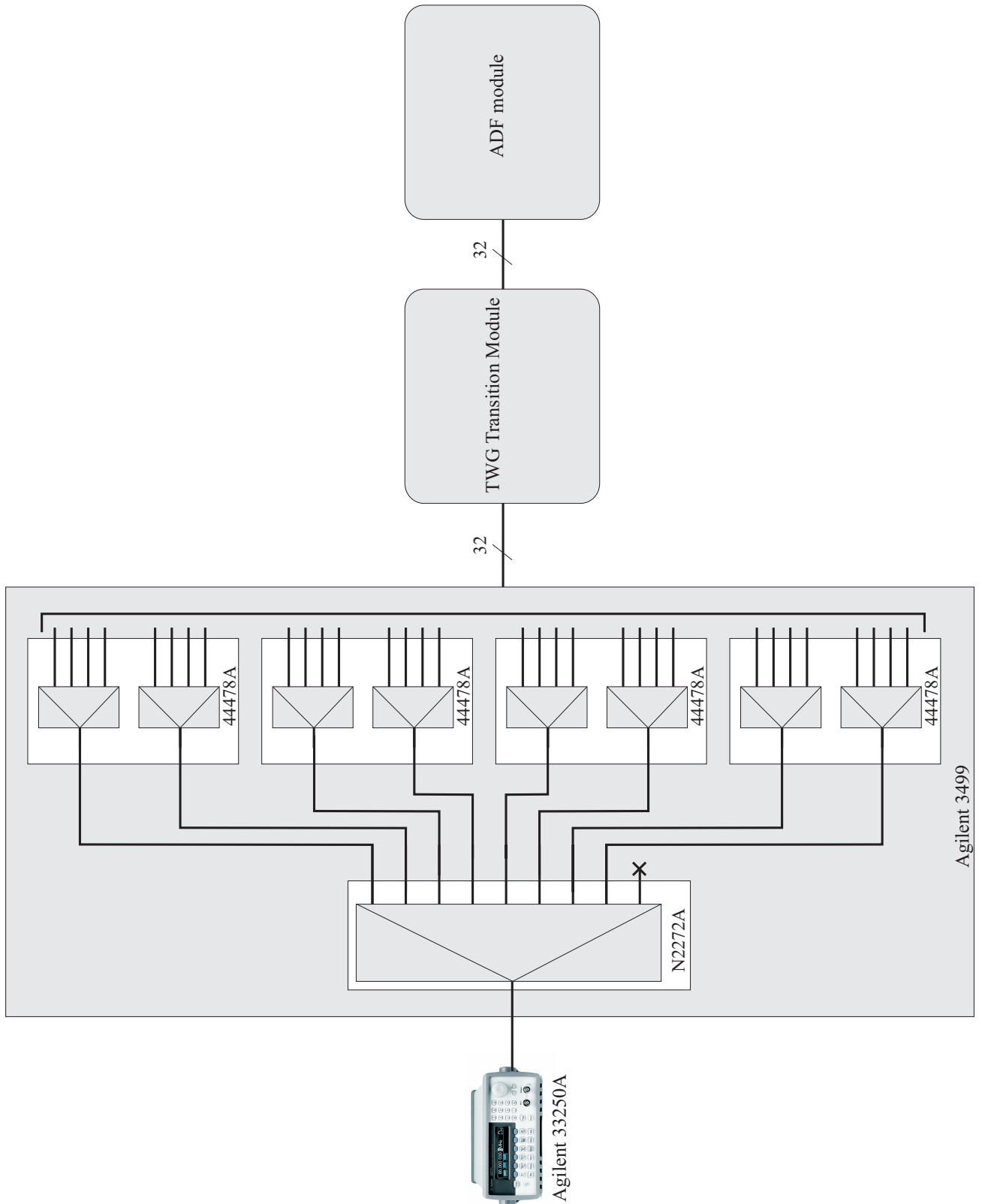
Power Supply

100-240 VAC, 50-60Hz

100-127 VAC, 50-400Hz

Power consumption: 140 VA

Switch System



Mainframe

Agilent 3499A Switch/Control System, 5 slot mainframe



Interfaces

IEEE-488 (GPIB, HPIB)

RS232

Power Supply

100-240 VAC, 50-60Hz

100-127 VAC, 50-400Hz

Power consumption: 40 VA maximum

1x9 Multiplexer module

Agilent N2272A, 1 GHz 1x9 RF Multiplexer Module

Insertion loss (100MHz): <0.5 dB

Cross talk (100MHz): <-75dB

SWR (100MHz): <1.20

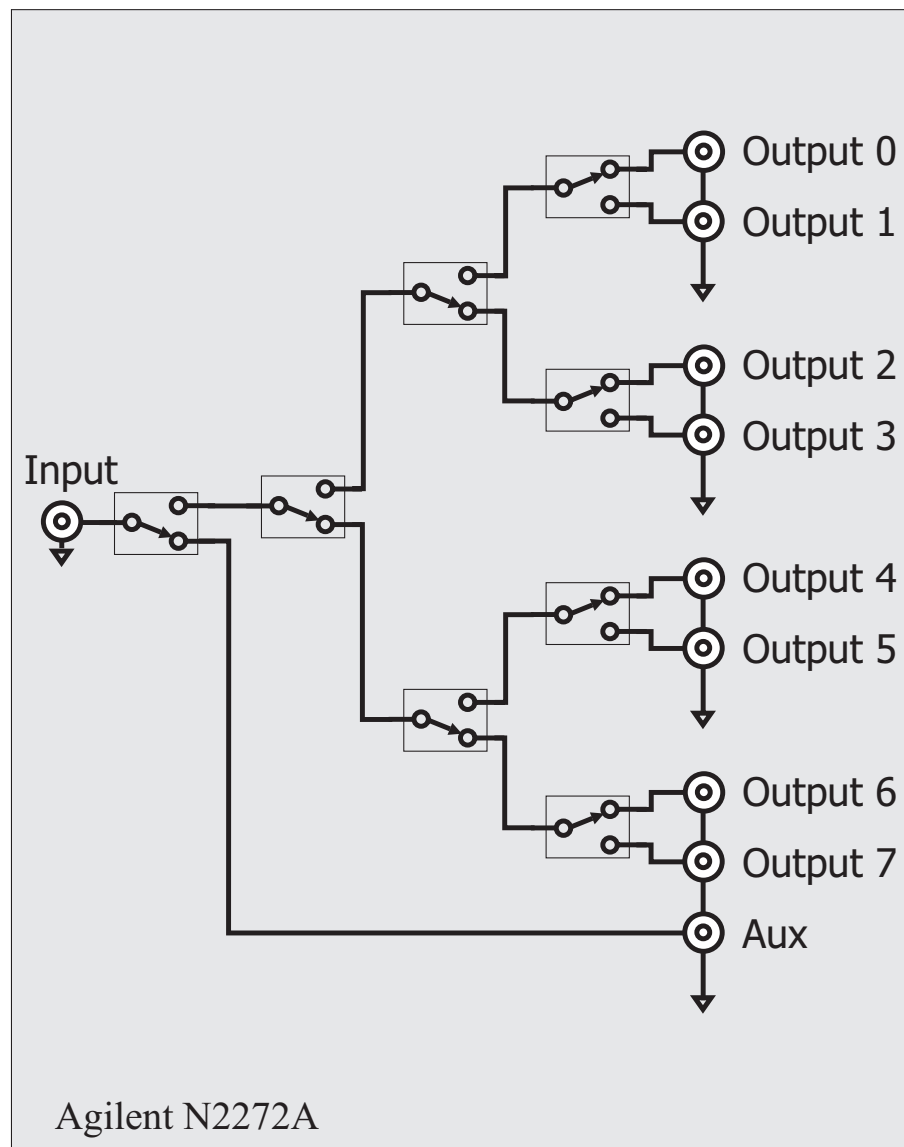
Bandwidth: 1.0 GHz

Characteristic impedance: 50 Ω

Signal delay: 2.5 nsec

Initial channel closed resistance: 0.8 Ω

Connector: BNC



1x4 Multiplexer module

Agilent 44478A, Dual 1x4 RF Multiplexer(1.3GHz, 50 Ω)

Insertion loss (100MHz): <0.7 dB

Cross talk (100MHz):<-80dB

SWR (100MHz): <1.25

Bandwidth: 1.3 GHz

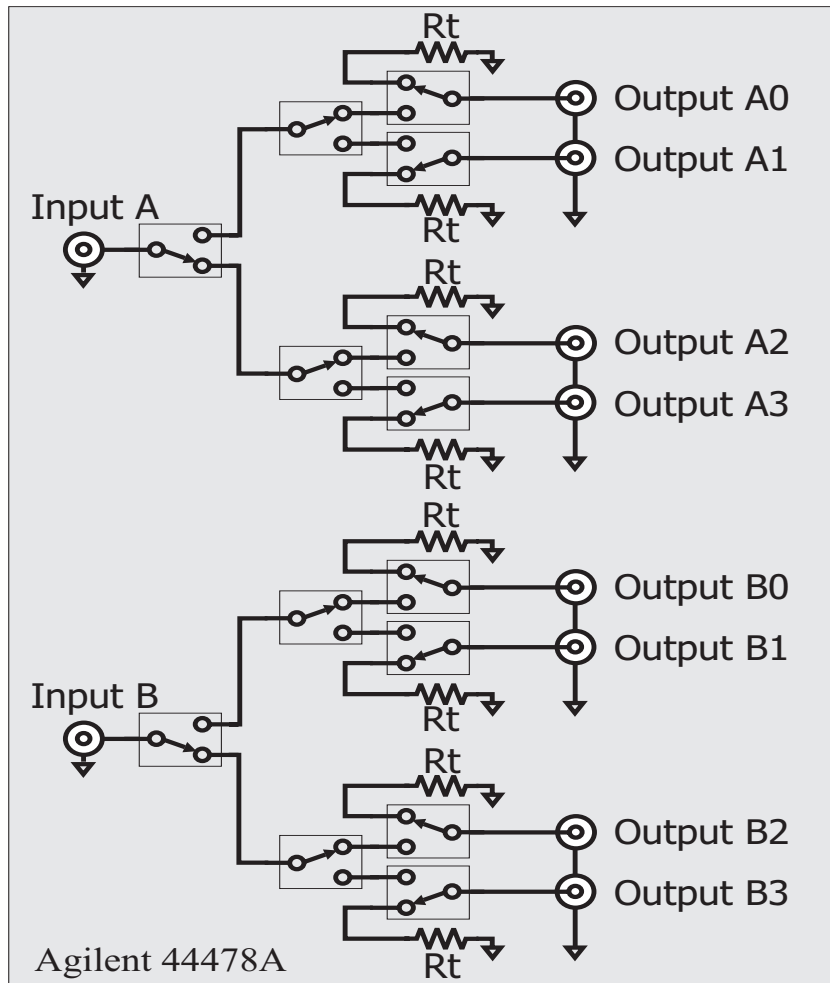
Characteristic impedance: 50Ω

Signal delay: 3 nsec

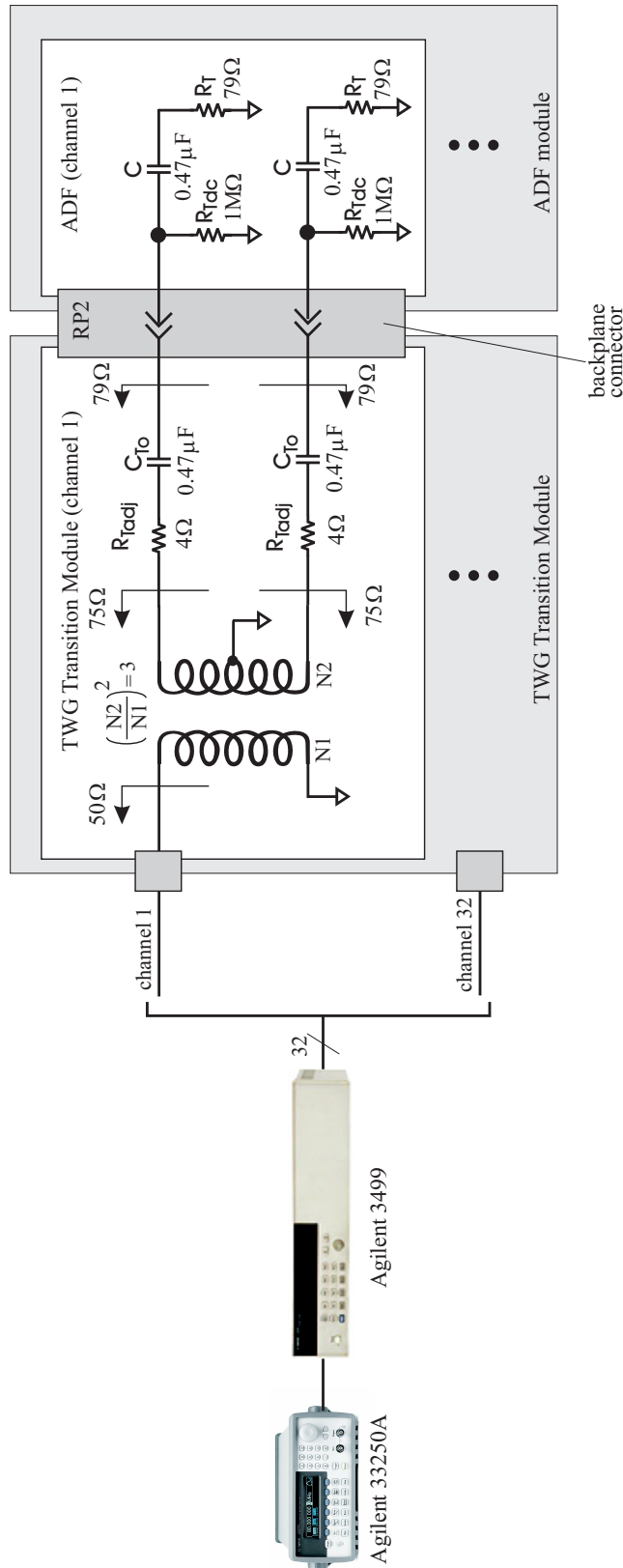
Initial channel closed resistance: 1 Ω

Connector: BNC

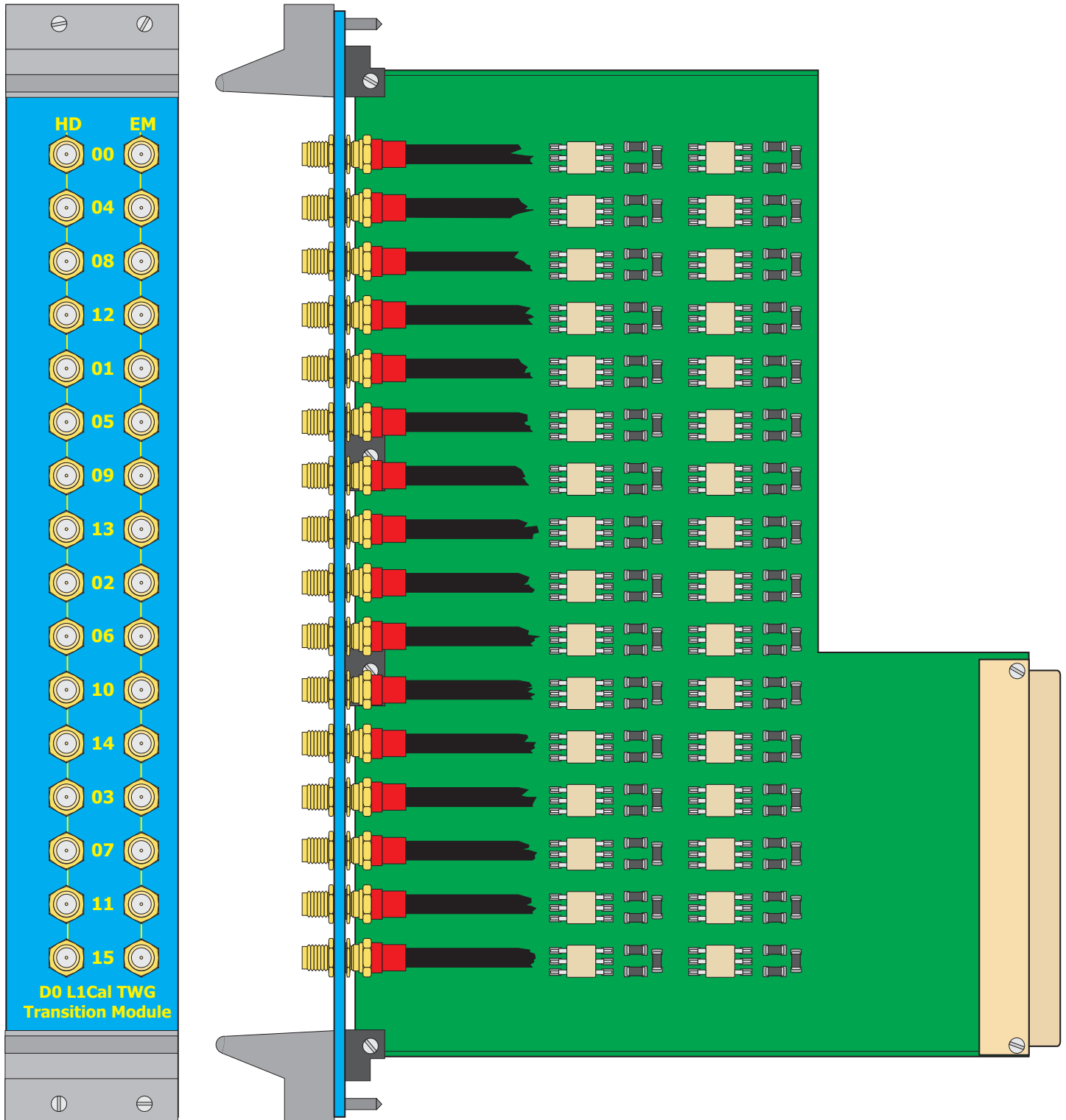
Off-channels termination: Yes



Custom VME 64x Transition Module



TWG Transition Module



Extra equipment/component needed

- a) One custom Transition Module to interface with ADF card.
(32 BNC or SMA inputs, single-ended to differential converters, impedance adapters, 32 differential output on a J2 stile connector.

- b) 32 SMB 50 Ω terminations. To terminate unused ADF inputs on the Agilent 44478A modules.

- c) 41 coaxial cables terminated with BNC jacks, 50 Ω characteristic impedance.
One of the cables is used to connect the waveform generator to the switch system.
Eight cables to connect the first multiplexer (1x9) to the other four multiplexing modules (dual 1x4).
Thirty-two cables to connect the switch system to the VME64x transition module.

- d) 32 BNC to SMA adapters if the transition module has SMA input connectors.